MONTHLY WEATHER REVIEW.

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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during December, 1884, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month are also given, and their approximate paths shown on chart i.

The month was unusually cold over the northwestern part of the United States, the departures below the normal temperature amounting to from 10° to 23° from Dakota westward to the Pacific. Along the Atlantic and Gulf coasts the mean temperatures were slightly above the normal.

The weather was very severe during the last half of the month from Minnesota westward to the Pacific coast, attended in Oregon and Washington Territory by unusually heavy snowfalls, causing much loss of life and property.

The precipitation was excessive in nearly all portions of the country, the exceptions being the north Pacific coast region and the Rio Grande valley. In the west Gulf states and California it was unusually heavy and resulted in destructive freshets.

On chart i. the tracks of eight barometric depressions are traced; the average number for December during the last ten years is thirteen, or five more than for December, 1884.

In the preparation of this REVIEW the following data, received up to January 20th, 1885, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-nine Signal Service stations and seventeen Canadian stations, as telegraphed to this office; one hundred and fifty-six monthly journals and one hundred and sixty monthly means from the former, and seventeen monthly means from the latter; two hundred and sixty-six monthly registers from voluntary observers; forty-two monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports, through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly reports from the New England Meteorological Society, and from the local weather services of Alabama, Illinois, Indiana, Iowa, Louisiana, Minnesota, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts; and special reports.

ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The distribution of mean atmospheric pressure over the United States and Canada, as determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart ii.

An area of barometric maxima is shown over the upper Missouri valley and the northern and eastern portions of Montana, the highest barometric mean, 30.32, being reported from Fort Buford, Dakota, and Poplar River, Montana. A small area, including portions of Dakota and eastern Montana, is inclosed by the isobar for 30.3, while that for 30.25 is traced from near Minnedosa, British America, southeastward to southeastern Dakota, and thence northwestward to the northern boundary of Montana to the west of Fort Benton. The mean pressure is least over southwestern Arizona and southern California and along the coasts of southern Oregon and northern California. The lowest barometric means, 29.91 and 29.93, are reported from Cape Mendocino, California, and Yuma, Arizona, respectively.

As compared with the mean pressure for the preceding month (November) a line connecting the stations where no change has occurred extends from the northwestern boundary of Montana southeastward to the east Gulf coast. To the eastward of the line mentioned an increase has taken place, while to the westward there has been a marked decrease. The increase is greatest in the extreme northwest, the Saint Lawrence valley, and northern New England, where it varies from .10 to .18. Over the central Rocky mountain districts the decrease has been unusually large. The area of barometric maxima which was shown in this region on the chart for November has apparently moved to the northward, and its position is now occupied by an area of comparatively low barometric readings. The following stations report the most marked departures as compared with November: Salt Lake City, Utah, .31; Denver, Colorado, .21; Boisé City, Idaho, .20; Cheyenne, Wyoming, .18. Over nearly the entire country to the west of the line of no change, as compared with the November means, the deficiencies exceed .10.

The departures from the normal pressure for December are given in the table of miscellaneous meteorological data, and are also exhibited on chart iv. by lines connecting stations of equal departure. The normal line extends from northwestern Montana southeastward to the central Ohio valley, and thence southward to Jacksonville, Florida. To the northward of this line the mean pressure is above the normal, except over a small area in the upper lake region, where it is normal. The departures exceed .05 in central-northern Montana, in eastern Dakota, Minnesota, New England, and portions of the middle and south Atlantic states, but with the exception of .10 at New London, Connecticut, they vary from .05 to .08. To the southward of the normal line above mentioned the mean pressure is below the normal, the departures being decided over the middle plateau and middle Pacific coast regions, where they vary from .15 to .22.

BAROMETRIC RANGES.

The monthly barometric ranges were greatest in the districts from the upper Mississippi valley eastward to the New England coast, and least along the southern borders of the country; they exceeded 1.00 in the northern plateau, north Pacific coast region, and east of the one hundredth meridian, north of latitude 37°. The largest monthly ranges are: 1.50 at Eastport, Maine; 1.46 at Portland, Maine; 1.39 at Rochester and Oswego, New York; 1.39 at Grand Haven, Michigan. The smallest are: .29 and .43 at Key West and Sanford, Florida, respectively. The monthly ranges for the several stations of the Signal Service are given in the table of miscellaneous meteorological data.

AREAS OF HIGH BAROMETER.

Five well-marked areas of high barometer passed over the districts east of the Rocky mountains during the month, all of which were first observed north of Montana, or approached from the north Pacific coast. The general direction of the movement of these areas was to the southeast from the point where first observed to the upper Mississippi valley, and to the east, after the area of greatest pressure had passed to the east of that valley. The following is a detailed description of these areas as traced from the tri-daily telegraphic reports:

I.—The large area of high barometer which extended over the plateau districts at the close of the preceding month continued almost stationary until the 5th of December, when the pressure increased on the Pacific coast, and this area apparently advanced from the Pacific ocean, moving in a northeasterly direction. On the afternoon of the 5th it was central west of northern California, and by the morning of the 6th it was central near the mouth of the Columbia river, where it remained on the following morning, although its eastern quadrants had extended over the northern Rocky mountain districts. During the succeeding twenty-four hours the movement was to the southeast, covering the eastern slope of the Rocky mountains with an enclosed area of 30.50, extending from Texas to Montana, while the isobar of 30.40 enclosed the regions from the south Atlantic states to Oregon. The pressure reached its maximum in Nebraska at this report, although it remained nearly stationary both as to pressure and movement until the morning of the 9th. At midnight of the 9th the centre of this area had reached the central Ohio valley with, however, a decrease of .10 in the barometer, and during the 10th it passed over the south Atlantic states attended generally by clear weather in all districts on the Atlantic coast.

II.—This area also approached from the north Pacific coast, it being central in the upper Columbia river valley at the a. m. report of the 9th. It passed eastward to Dakota and thence northward during the 11th, extending to the southward at midnight and west of the well-marked low area in the Ohio valley, while the crest of this cold wave remained north of Dakota, where the temperature had fallen to —12°. On the morning of the 12th this area covered the northwest and the regions between the Rocky mountains extending westward to Idaho, while the centre was in the northeastern part of Dakota. It moved rapidly southward during the 12th over the Missouri valley attended by light snows, but with no decided fall in temperature, and at the a. m. report of the 13th it was central near Saint Louis, the barometer having fallen at the centre during its southern movement. The course of this area changed from south to east, and it passed over the Ohio valley to the Atlantic coast, first with decreasing pressure followed by an increase of .10 inch when central on the coast. After reaching the Atlantic coast the course changed to the northeast apparently following the coast line until beyond the limits of observation.

III.—This area remained far to the north of Montana from the 14th until the 17th, but caused decided changes in temperature in the extreme northwest and at northern mountain stations on the 14th and 15th. On the 16th the temperature ranged from —15° to —28° at the stations in Dakota and Montana. A secondary high area formed and moved southward to the lower Missouri valley, causing the temperature to fall to zero in Kansas during the 16th. This secondary area united with the original one on the 17th, and the crest of the cold wave continued in the region north of Minnesota on the morning of the 18th, where the temperature ranged from —25° to —40°. This area moved southeastward until it reached the upper Mississippi valley, after which it passed directly eastward over the lake region, causing the barometer to rise above 30.60 and to 30.70 when passing over New York and New England, thus showing, as in the preceding area described, a slight increase of pressure as it approached the coast. The course of this area also changed from east to northeast after passing off the coast, and it disappeared rapidly to the east of Sidney during the 21st.

IV.—This area appeared in the region north of Montana on the 19th, and continued central north of the United States until the 25th, although the cold attending it was felt in Nebraska on the 21st, the temperature falling to —16° at North Platte on the morning of that date, while the temperature ranged from —20° to —39° at stations to the northward. The a. m. report of the 22d indicated intense cold north of Minnesota and Dakota, the temperature being generally below —40°. This cold wave reached the west Gulf states on the 24th, attended by freezing weather in Texas and Louisiana and by a light "norther." The temperature remained very low in the extreme northwest during the 25th, but the barometer fell while the centre of this area moved eastward over the lake region, following the track of the preceding area, passing over the upper Saint Lawrence valley, northern New England, and Nova Scotia, where it was last observed on the 28th.

V.—The a. m. report of the 28th indicated the approach of a cold wave from the Northwest Territory, and the succeeding reports of the 28th, 29th, and 30th, showed an increase of pressure and a continued flow of cold air over the eastern Rocky mountain slopes, while the barometer was highest and above 30.80 at the most northerly stations at the close of the month. The advance of this area was apparently retarded by the development of a severe storm in the upper Mississippi valley, but the gradient was increased in the west quadrants of this low area, by the cold wave which moved to the southward with increased energy, causing a violent "norther" on the west Gulf coast on the 31st. At the close of the month this area extended over the Mississippi and Ohio valleys and the upper lake region, while the crest of the cold wave continued north of Dakota, where the temperature ranged from —30° to —42°, and the barometer was above 30.90.

AREAS OF LOW BAROMETER.

Eight areas of low barometer have been traced within the limits of the stations, while a number of depressions passed eastward over British America, far to the northward, but in some instances these depressions were attended by marked changes in the weather conditions of the northern districts. The centres of these disturbances could not be accurately located upon the tri-daily telegraphic charts, although their general easterly movement was well marked by changes occurring far to the south of the centre of disturbance. The areas traced within the limits of the United States all moved northeasterly from the Mississippi valley; two approached from the north Pacific coast, passing southeasterly to the west Gulf states, and one proceeded eastward to Colorado, where it disappeared, but was followed quickly by the development of a storm in the central Mississippi valley. The two depressions traced from the north Pacific coast were separated by an interval of but twenty-four hours, and they united in Arkansas, the principal area passing to the northeast.

In the following table will be found the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long W.	
	°	°	°	°	
No. I	37	97	49	55	26
II	31	95	38	74	46
III	35	123	38	105	34
IV	37	90	51	64	51
V	46	127	50	62	48
VI	47	125	36	93	79
VII	37	85	47	58	48
VIII	43	90	51	67	53
Mean hourly velocity					48.1

I.—This storm developed in the southwest on the 4th and was a secondary depression caused by the advance of an extended low area north of the United States. At midnight of the 3d the barometer had fallen to 29.50 and below north of Minnesota, and high areas relatively extended over the south

Atlantic states and the mountain districts, with an intervening barometric trough extending southwesterly to the Rio Grande valley from the upper lake region. This condition resulted in the formation of a second depression, central in northern Arkansas on the morning of the 4th. The rapid increase of the high area in the mountain districts forced this storm to the southeast during the succeeding twenty-four hours, and by the morning of the 5th it was central near Little Rock, the area of rain extending over the Gulf states and northward to the lake region. During the 5th the central area extended and moved slowly northward to the lower Missouri valley, while the rain extended over the lower lake region and the south Atlantic states. After reaching the lower Missouri valley this storm contracted, becoming nearly circular and increasing in energy. The barometer fell from 29.62 to 29.34 in its transit from Arkansas to Michigan, where it was central at the p. m. report of the 6th. While passing over the lake region the circular form of the central area changed to that of an ellipse, with the larger axis nearly parallel with the latitude, but inclining in the direction of the movement of the storm. This storm increased in violence as it passed over the lake region, the barometer falling to 29.06 north of Lake Ontario at 7 a. m. of the 7th, while it read more than one inch higher at stations to the east and west on this latitude. The gales attending this storm were severe in the lake region, and on the Atlantic coast as far south as Smithville, North Carolina, the strongest winds coming from the south or southwest on the Atlantic coast, while the storm was over the lake region, and from the west or northwest in the lake regions after the storm-centre had passed to the Saint Lawrence valley during the night of the 7th and the morning of the 8th. It was last observed in the extreme northeast as a decided and well-marked ocean storm, the isobar of 29.10 indicating a still lower pressure to the eastward of the coast near Sidney, at the p. m. report of the 8th.

The following notes relative to this storm have been reported by the Signal Service observers:

Smithville, North Carolina, 6th: high southerly winds prevailed from 6.30 a. m. to 5 p. m.; a velocity of 29 miles, south, was recorded at 10.06 a. m. Thirteen vessels remained in harbor during the signal display for this storm.

Cape May, New Jersey, 6th: a southeasterly gale began at 1.08 p. m.; later the wind shifted to the southwest and reached a velocity of 52 miles at 9 p. m.

Fort Myer, Virginia, 6th: strong southerly winds prevailed from 5 to 8.45 p. m., the wind reaching a velocity of thirty-one miles, south.

Knoxville, Tennessee: light rain fell during the night of the 5–6th, and ended at 10 a. m.; showers also fell from 11.04 to 11.50 a. m., and from 1.48 to 2.10 p. m., the latter being accompanied by high wind which blew down fences, signs, etc.; the wind reached a velocity of thirty-six miles from the southeast; the storm ended at 5 p. m.

Louisville, Kentucky: the barometer fell rapidly during the early morning of the 6th, and easterly winds prevailed; in the afternoon the wind shifted to southwest and blew with the force of a gale from 2 to 4.30 p. m.; the barometer rose rapidly during the evening.

Pittsburg, Pennsylvania, 6th: light northeast to east winds prevailed during the day; at 6.30 p. m. the wind shifted to northwest and blew with increased force; for five minutes it blew at the rate of thirty-three miles per hour, doing considerable damage in this city.

Columbus, Ohio, 6th: a high southwesterly wind began at 5.51 and continued until 8.16 p. m. when the wind abated but became high from the same quarter at 2.46 a. m. on the 7th; at noon on the latter date the wind veered to west and continued with gale force until 9.56 p. m.; a maximum velocity of forty-three miles from the west occurred at 1.56 p. m.

Sandusky, Ohio: the storm began during the morning of the 6th and continued until about midnight of the 7–8th, the wind being from southwest to west; a maximum velocity of thirty-nine miles from west occurred at 8.08 p. m., on the 7th.

Toledo, Ohio, 6th: high southwesterly winds prevailed after 5 p. m., and continued until 3 a. m. on the 8th. Much damage was done by the storm in the city.

Detroit, Michigan: a high southwesterly wind began at midnight of the 6–7th, continuing all day, and during the 8th also; the maximum velocity during this storm, thirty-nine miles from southwest, occurred at 6.21 a. m. on the 8th. Boats experienced much difficulty in making trips across the river.

Port Huron, Michigan, 7th: a southwesterly gale prevailed from 1.42 a. m. until about midnight of the 7–8th; the highest velocity of the wind, thirty-seven miles southwest, occurred at 2.12 p. m. of the 7th.

Grand Haven, Michigan, 7th: during the early morning high southerly winds prevailed, which afterward shifted to west and blew with increased force throughout the day; a velocity of forty-eight miles from the west was recorded at 4.46 p. m. The storm ended about 11 a. m. on the 8th.

Erie, Pennsylvania, 6th: the storm began at 12.28 p. m. and continued until 10 a. m. on the 9th; the prevailing wind during the storm was from the west; the maximum velocity, from that quarter, occurred at 6 p. m. on the 7th.

Buffalo, New York, 6th: the storm began at 9.43 p. m.; it continued during the 7th and until 8.53 p. m. on the 8th; a maximum wind velocity of fifty-six miles per hour was recorded at both 2.03 and 6.13 p. m. on the 7th, the total movement of the wind for that day being nine hundred and ninety-seven miles. A part of the instrument shelter was blown away during this storm.

Rochester, New York, 6th: during the day brisk to high southeasterly winds prevailed, increasing to a gale at 4 p. m.; at 8.30 p. m. a velocity of thirty-six miles was recorded; at 9.45 p. m. the wind had fallen below twenty-five miles, but it attained a high velocity during the early morning of the 7th and continued high with varying force during the day. A squall blew away the cups of the anemometer at 11.18 a. m., at which time the instrument indicated sixty miles per hour; the squall lasted about twenty minutes. The clouds were of a dark and heavy appearance at an unusually low altitude, and moved with great rapidity from west-southwest. The storm, which abated at night, caused considerable damage in this vicinity.

Oswego, New York: high winds began about mid-day on the 7th, and continued until mid-day on the 9th; the maximum velocity of the wind at this station, on the 7th, was thirty-four miles from the west at 10.32 p. m. An anemometer on the beacon was blown away at 9 p. m. on the same date, after having recorded fifty-two miles. Very rough weather prevailed on the lake; the schooner "W. J. Suffell" and the propeller "Celtic" sustained damage; from fifty to one hundred feet of a new pier was carried away on the 8th; on this date a velocity of thirty seven miles from the west was recorded at 2.07 a. m.

Narragansett Pier, Rhode Island, 7th: a southeasterly gale began at 12.30 and ended at 4.30 a. m.; the wind blew at an estimated velocity of sixty-five miles per hour; steamers from New York City to Providence and Fall River were delayed by this storm.

Point Judith, Rhode Island: high southeasterly wind prevailed during the evening of the 6th; at 2.45 a. m., on the 7th, the wind suddenly increased in force to a strong gale, the velocity being estimated at fifty-five miles per hour; the storm abated at about 3 a. m. Several small buildings and considerable fencing were blown down at this place.

II.—This storm is marked as central in eastern Texas on the morning of the 11th, but it probably developed south of the west Gulf states and its energy was increased by the southerly movement of a high area immediately to the north. The rains were unusually heavy in the lower Mississippi valley during the 11th, and snow occurred to the north over the lake region and the northwest, while the principal disturbance moved directly northeast to the upper Ohio valley, attended by in-

creasing pressure, the barometer being about .20 inch higher at the centre at the 7 a. m. report of the 12th than it was on the morning of the 11th. This storm passed directly east over the southern portion of the middle Atlantic states and was last observed as central near Delaware Breakwater. It apparently lost energy as it advanced to the eastward, but while near the middle Atlantic coast, strong northeasterly winds ranging from thirty to thirty-seven miles per hour occurred on the New Jersey coast.

III.—This low area passed eastward from the Pacific during the 11th, but its centre can only be approximately located. It moved slowly eastward over the central plateau region, following the high areas then east of the Rocky mountains, but disappeared after reaching Colorado on the 14th. The a. m. report of the 14th indicated the development of a storm in the lower Mississippi valley, but this cannot be traced from the mountain districts as a continuation of number iii.

IV.—This storm was clearly defined, central near Cairo, sixteen hours after number iii. was last observed in Colorado. General rains prevailed in the Southern states and central valleys and light snows in the lake region and the northwest during the 14th. These conditions extended over all of the Atlantic coast districts during the night, the storm-centre passing over the lower lake region attended by severe gales. The pressure decreased at the centre of disturbance from 29.70 to 29.30 in passing from Cairo to Kingston, where the centre was at the 7 a. m. report of the 15th. This depression moved to the northeast, following the general course of the Saint Lawrence valley, causing dangerous gales at the northeast Canadian stations. Its centre has not been located after midnight of the 15th, but later reports indicated a change of direction towards the east. When the principal disturbance was to the northeast of Quebec, a slight secondary depression developed north of the lower lake region, causing light snows to continue in the lake region on the 16th.

The following notes are from the reports of Signal Service observers:

Louisville, Kentucky, 14th: the barometer fell rapidly until 9 p. m., when the wind shifted from southeast to southwest and blew at the rate of thirty-one miles per hour; the wind subsided at midnight.

Grand Haven, Michigan, 15th: the storm began at 4 a. m. and continued until about midnight; a velocity of thirty miles from the west occurred at 10 a. m.

Sandusky, Ohio, 15th: the storm began at 2.38 a. m. and continued until 7.38 p. m.; the maximum velocity of the wind, thirty-three miles from the west, occurred at 3 a. m.

Buffalo, New York, 15th: at 5.28 a. m. the wind veered suddenly from south-southeast to southwest and increased to a gale; it continued with great violence, the wind reaching a velocity of sixty-four miles at 8.13 a. m., and for five minutes it blew at the rate of seventy-four miles per hour. Several buildings in this city were badly damaged. Along the water front the damage was especially heavy; the lake, creek, and canal rose to such heights as to flood all cellars in this part of the city; the New York Central railroad track was submerged for a considerable distance, and in one place two hundred feet of trestle-work were carried away; a strip of land at the foot of Michigan street, locally known as the island, was submerged and fifteen small houses were washed away. The streets of the city were strewn throughout with signs, chimneys, and other debris. The waves on the lake during this storm are reported to have been the highest ever observed here.

Erie, Pennsylvania, 14th: the storm began at 8 p. m. and continued until midnight of the 15–16th; high southwest to west winds prevailed, the maximum velocity, thirty-seven miles southwest, occurring at 12.35 p. m. on the 15th.

Rochester, New York, 15th: during the early morning the wind increased to a gale, blowing from the west; the storm continued until 6.45 p. m.; the maximum velocity, fifty-four miles per hour, occurred at 9.30 a. m.

New London, Connecticut, 15th: a southeasterly gale began at 5.45 a. m. and ended at 8.05 a. m.; the maximum velocity, thirty-seven miles, occurred at 6.10 a. m.; this storm was accompanied by a dangerous cross sea in the Race; many vessels remained in harbor.

Eastport, Maine, 15th: a gale began at 10.05 a. m. and ended at 3.05 p. m., the wind reaching a velocity of forty-eight miles from the southeast at 1.35 p. m. The schooner "Hildegard" went ashore on Cutler island, twenty miles south of this station, and proved a total loss. Three steamers and eighteen schooners remained in port during the display of signals for this storm.

V.—The barometer continued low on the north Pacific coast from the 13th until the 19th, when reports from the central mountain stations indicated a southeasterly movement of this low area. A cold wave covered the districts east of the Mississippi river at midnight of the 19th, the crest of this wave being near Lake Ontario, while the low area was passing over the northern plateau region, the pressure being 29.70, or 1.00 inch lower than that observed near the crest of the cold wave. Between these conditions the gradient was uniform and the distance between the high and low was 1,800 miles. The low area moved rapidly to the southeast, and by midnight of the 20th it had reached northern Texas, while the easterly movement of the high area, above referred to, left a barometric trough extending over the Mississippi valley, thus favoring the development of low areas in the central valleys. Number v. was central in the lower Ohio valley on the 21st at 7 a. m., but the 3 p. m. report of this date showed a westerly movement to a point near Little Rock, and the midnight chart of the 21st exhibited two low areas, one in Arkansas, and the other central in the upper lake region near Milwaukee. The rapid advance of a cold wave over the eastern slope of the Rocky mountains apparently crowded these low areas to the eastward, causing the more northerly one to increase in energy and the one in the Gulf states to fill up during the 22d. This storm was violent while passing over the lake regions, the wind reaching a maximum velocity of fifty-two miles per hour at Buffalo on the 22d, when the gradient in the western quadrants was one inch to seven hundred miles. The barometer continued to fall as the storm moved to the northeastward, reaching its lowest reading, 28.99, at the extreme northeast stations, which was 0.60 inch lower than that observed at the centre of this storm in the upper lake region.

Signal Service observers report the following in regard to this storm:

Buffalo, New York, 22d: a severe southwesterly gale began at 9.23 a. m. reaching a velocity of fifty-nine miles at 4.23 p. m.; the storm continued until 6 a m. of the 23d, a velocity of forty-four miles, west, occurring at 4 a. m.

Oswego, New York, 22d: a gale began at 4.32 p. m. and continued until 8.57 p. m., on the 23d; a wind-velocity of forty-four miles from the west occurred at 4.07 on the latter date.

New Haven, Connecticut; the schooner "Onrust" sprung a leak and sank in the harbor during a high wind and unusually heavy sea on the afternoon of the 21st.

New London, Connecticut, 21st: high southerly winds prevailed during the afternoon, beginning at 4.45 p. m. and ending at 1.20 a. m. of the 22d; a maximum velocity of thirty-six miles, south, occurred at 12.35 a. m.

Boston, Massachusetts, 21st: heavy snow fell during the early morning, with wind from the southeast; a strong gale set in at 10.24 p. m., the wind reaching a velocity of forty-four miles from the south.

Thatcher's Island, Massachusetts: on the 23d the wind veered from south to northwest and blew with the force of a gale from 3.11 a. m. to 2.51 p. m. a velocity of forty-three miles per hour occurring at 3.01 a. m.

VI.—The depression previously traced as number v. passed over the same general track to the southeast from the north Pacific coast, only preceding number vi. by twenty-four hours. When number v. reached the lower Ohio valley, number vi.

was central near Cheyenne, and the succeding tri-daily report showed a union of these areas in the west Gulf states. After uniting there was an apparent tendency to separate, but the small area which existed in the east Gulf states sixteen hours afterwards, disappeared in front of the cold wave then advancing over the central valleys.

VII.—This area was first marked as central in east Tennessee at midnight of the 23d, but a low area had passed southeastward from the north Pacific coast during the previous day. It moved directly north to southern Michigan during the first eight hours, while a cold wave passed rapidly south over the regions between the Mississippi river and the Rocky mountains. On the 24th the course changed to easterly and it passed over central New England, attended by general snows and followed by a decided fall of temperature over the greater portion of the districts east and south of the Missouri valley. The temperature fell to 15° and 25° at Palestine and Indianola, Texas, respectively, on the morning of the 25th. After passing east of the New England coast, this storm followed the coast line to the northeast, causing severe gales at the extreme northeast stations on the 26th. When last observed the barometer was falling at the centre and the storm was apparently increasing in force.

VIII.—This area developed in the upper Mississippi valley on the morning of the 30th, there being at the same report a low area in southern Texas. As in the two preceding storms, the development was hastened by a rapid flow of cold air from the northwest, there being at this time a well-marked cold wave far to the northwest of the storm centre. The p. m. report of the 30th, exhibited a succession of low areas extending from Lake Huron to southern Texas, with high areas extending along the Atlantic coast, and in the northwest, over mountain districts. The cold air from the north filled up the trough of low pressure during the following eight hours, and the midnight report of the 30th, exhibited a circular low area central in northern Illinois. The isothermal lines were almost south and north in the western portion of the storm area, the temperature being 57° at Chicago, and —4 at Yankton. This storm passed rapidly over the lake region to the Saint Lawrence valley, followed by a decided cold wave, high northerly winds, and general rain or snow in all districts east of the Rocky mountains.

NORTH ATLANTIC STORMS DURING DECEMBER, 1884.

[*Pressure expressed in inches and in millimetres; wind-force by scale of* 0-10.]

The paths of the depressions that have appeared over the north Atlantic ocean during the month are determined, approximately, from the international simultaneous observations furnished by captains and agents of ocean steamships and sailing vessels; abstracts of logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports obtained through the co-operation of the "New York Herald Weather Service," and from other miscellaneous data received at this office up to January 21st, 1885.

The international simultaneous observations are taken each day at 7 a. m. Washington, or 12 hrs. 8 m. p. m. Greenwich mean time.

For the month of December, 1884, seven depressions have been traced over the Atlantic within the region covered by the reports. Of this number, two only, low areas 3 and 6, are continuations of depressions which passed over the United States and Canada. Numbers 2 and 5, developed in the region south of 40° N., and west of 60° W., the former causing moderate gales on the North Carolina coast during its passage, while the latter displayed considerable energy near the Banks of Newfoundland. The remaining depressions appeared over the region north of the fiftieth parallel and east of the fortieth meridian.

During the first and second decades of December, 1884, moderate to strong sw. to w. and nw. gales, with rain, snow, hail, and sleet prevailed over the Atlantic between the parallels of 40° and 55° north; from the 23d to the close of the month, the weather cleared and the winds moderated to strong breezes, reaching occasionally the force of a moderate gale. Several depressions appear to have passed eastward over the region north of the sixtieth parallel; south of 40° N., generally fine weather prevailed. Towards the close of the month, frequent and dense fogs were reported to the westward of 45° W.

The following descriptions refer to the depressions charted:

1.—At the close of November a depression occupied the ocean north of the fiftieth parallel and west of the fortieth meridian, causing moderate sw. gales over the Banks. It moved slowly eastward during December 1st and 2d, the barometer falling to 29.2 (741.7) on the fiftieth parallel during those dates. On the 1st the s. s. "Habsburg," F. Pfeiffer, commanding, had a heavy ssw. to w. gale in N. 48° 42′, W. 40° 06′, and the s. s. "Saint Laurent," M. de Jousselin, commanding, came under the influence of the disturbance on the 2d. The last-mentioned reported as follows: "During the afternoon of the 1st, light breeze from sw.; from 6 to 8 p. m., overcast and rainy, barometer 29.88 (758.9); after 8 p. m. the barometer began to fall rapidly and the winds increased from se. (latitude 48° 12′ N., longitude 39° 0′ W.). At midnight of the 1–2d, barometer 29.52 (749.8), strong sw. wind, violent squalls and high sea; 6 a. m. of the 2d, barometer 29.17 (740.9), wind w., force 7–8; 10 a. m., 29.45 (748.0), wind nw., force 7–8; 2 p. m., barometer 29.56 (750.8), wind nw., force 6; after this the weather moderated and the barometer rose slowly." The s. s. "Venetian," W. H. Trant, commanding, near N. 50° 40′, W. 28° 30′, on the 2d, reported as follows: "4 a. m. of 2d, light baffling winds from ssw. to sse. and wsw., incessant rain; 8 a. m., same weather, long wnw. swell; 10 a. m., set in a hard gale from ssw., barometer 29.1 (739.1), constant rain; noon, hard gale, force 8, barometer 29.02 (737.1), rainy; 2 p. m., sudden shift of wind from sw. to nw., sea not heavy, sky breaking; and wnw. swell disappearing, barometer 29.03 (737.3); 4 p. m., hard wind, rough sw. and wnw. sea, barometer rising. We have not had the wind to correspond with the low barometer." During the 2d the disturbance apparently moved in a northeasterly direction, and by the 3d it was shown as a severe storm off the Irish coast, the barometer near the centre being below 28.9 (734.0).

2.—This depression probably developed during the 2d over the region south of 35° N. and west of Bermuda; its presence was indicated by the heavy ssw. to wsw. gales, which were encountered by the s. s. "Sirius" in N. 30°, W. 66°, on that date, while ne. gales of forty miles an hour and decreasing pressure were reported from Cape Hatteras and other stations on the North Carolina coast.

On the 3d the southerly gales continued over the region between N. 30° and 37°, and W. 62° and 70°, shifting during the day to westerly.

The ship "Ariel," F. Schwings, commanding, reported a heavy gale at 10 a. m. of the 2d in N. 37° 38′, W. 72° 26′, lasting eight hours; the wind set in from sw. and veered to nw., accompanied by heavy rain; the minimum pressure, 29.36 (745.7), was recorded at 11 a. m. The disturbance moved northeastward, skirting the coast of Nova Scotia during the 3d, and by the morning of the 4th it was central on the Banks of Newfoundland, where it exhibited considerable energy.

The s. s. "Adriatic," H. Parsell, commanding, reported having had a sw. gale of force 8, veering to nw. during the afternoon of the 3d, in N. 41° 32′, W. 65° 51′; lowest barometer, 29.32 (744.7), observed at 4 p. m.

The s. s. "Habsburg," F. Pfeiffer, commanding, near N. 43° 51′, W. 56° 49′, had a heavy gale during the 4th; it began with a fresh breeze from se. and falling barometer, increasing to a s. gale of force 9; the barometer fell to 28.95 (735.3), with the wind blowing with hurricane force from sw., and accompanied by heavy rain; the barometer then began to rise slowly and the wind shifted to wsw., but continued to blow with unabated force from that quarter, when it again shifted to nw. and moderated.

The depression moved rapidly northeastward and by the 5th it had reached N. 55°, W. 30°; on that date the s. s. "Norseman" in N. 50°, W. 31° had a heavy gale from sw. veering to w. by n. lasting several hours; the s. s. "Lepanto," J. T. Rogers, commanding, in N. 47° 12′, W. 27° 0′, had a strong gale from sw. by s. to wsw. with very high sea from wnw. and nw.

The s. s. "Thingvalla," S. T. H. Laub, commanding, reported as follows: "December 4th, during the evening, in about N. 56° 28′ W. 25° 30′, the barometer began to fall, with steady rain. At 8 p. m. (ship's time) the barometer (aneroid) read 29.5 (749.3), wind se. by e. force 6; at 4 a. m. of the 5th, 28.55 (725.2), wind se. force 9; 6 a. m. 28.45 (722.6), wind ssw. force 9; noon, 28.5 (723.9), wind ssw. force 10, showers of rain, ship's position by reckoning, N. 55° 55′, W. 28° 16′; hove to until 6 a. m. of the 6th, drifting towards the se. at the rate of two knots an hour. At 4 p. m., barometer read 28.55 (725.2), wind sw. force 10; 6 p. m. 28.6 (726.4), same wind, no abatement; midnight, barometer 28.66 (728.0), wind wsw. force 10; 4 a. m. of the 6th, 28.8 (731.5), wind wsw. force 10. Between noon of the 5th and 8 p. m., the wind blew with hurricane force causing the whole ship to tremble, the barometer oscillating one-tenth of an inch during this time; after 8 p. m. the squalls were less frequent and fierce, and after midnight the stars became visible; before this the atmosphere was misty, partly from rain and partly from the spray blowing about."

On the 6th, the disturbance was near the British coast, causing heavy w. gales on the fiftieth parallel, and strong sw. winds in the English Channel.

3.—This was a continuation of the depression traced over the United States and Canada as low area i. It passed over the Gulf of Saint Lawrence and Newfoundland during the 8th; on the 9th, the centre of disturbance was near N. 51°, W. 45°, where the pressure was 29.0 (736.6), moderate w. wind, while moderate to strong sw. and s. gales prevailed over the region to the eastward of the above-mentioned meridian. On the 10th and 11th, the centre of disturbance was between N. 50° and 55° and W. 40° and 35°, and during those dates the pressure ranged from 29.1 (739.1) to 29.5 (749.3) over the ocean from the Banks of Newfoundland eastward to the thirtieth meridian, and strong ssw. to w gales prevailed over that area.

During those dates the steamers "Anchoria," "Ems," "Main," "Lepanto," "City of Montreal," "Arizona," "City of Richmond," and "Canada," all between N. 51° and 43° and W. 57° and 28°, experienced the gales produced by this depression. Captain Campbell, of the s. s. "Lake Nepigon," reported a very heavy gale on December 11th in N. 53°, W. 32°, frequently reaching hurricane force. Between 11 a. m. of that date and 2 a. m. of the 12th the force did not fall below 9, and it continued to blow as a severe gale until 3 p. m. of the 12th. The greatest force, 10 (12 Beaufort scale), was experienced about 9 p. m. on the 11th, from sw. The barometer had fallen steadily from the preceding midnight until 2 p. m. of the 11th, when it was lowest, 29.1 (739.1), and did not begin to rise until 6 p. m., when it went up rapidly and the wind increased in severity. The sea was very high; the after wheel-house was smashed in by a wave as the vessel dipped her stern, and one of the boats on the side was driven through the deck, the iron davits snapping in two from the weight of water shipped. The wind veered from s. to w.

During the 12th and 13th the depression was between W. 20° and 30°, the barometer remaining below 29.0 (736.6), and the s. to w. gales continuing without abatement. During the 13th the depression appears to have moved northeastward to the British coasts.

4.—On the morning of the 16th the depression charted as low area number iv. over the United States was central over the northern part of the Gulf of Saint Lawrence with the barometer below 29.2 (741.7), attended by strong w. gales to the southward of Newfoundland, and equally strong s. gales eastward to the fiftieth meridian, and was apparently moving to the northward. On the 17th the circulation of the winds near N. 50°, W. 35° indicated the development or approach of a disturbance north of the fifty-third parallel. The s. s. "Circassian," W. Richardson, commanding, in N. 53° 20′, W. 32° 30′ on the 17th reported: "1 a. m., continual rain; 4 a. m., wind increasing and barometer falling rapidly; 7 a. m. barometer 29.28 (743.7), wind wsw.; noon, 29.26 (743.2), wind veering to w. and n.; 4 p. m., whole gale, barometer rising." Similar weather continued during the 18th as the disturbance moved slowly eastward, and by the 19th it was probably central over the British Isles, the steamers "City of Richmond, "Fernwood," "Clieveden," and "Bristol." having experienced heavy w. and nw. gales off the Irish coast.

5.—This disturbance apparently developed prior to, or during the 18th, in the region between N. 35° and 40° and west of W. 65°. On the 18th there was a slight fall of the barometer at stations on the Carolina coast, and nw. gales of forty miles an hour were reported, during which several vessels were driven ashore. The disturbance first became well-defined on the 19th when it was central near N. 40° W. 60°. The following reports indicate the severity of the gales produced by this depression:

S. S. "Roman," D. Williams, commanding, in N. 44° 15′, W. 54° 30′, on the 19th, had fresh s. breeze during the afternoon, barometer 29.2 (741.7), falling rapidly; at 6 p. m. it was blowing a severe gale from sw. (about 80 miles an hour), with torrents of rain, barometer 28.8 (731.5); 7 p. m., wind nnw., heavy cross sea; ship hove to from 10 p. m. of the 19th until 6 a. m. of the 20th.

S. S. "Pawnee," Harnden, commanding, in N. 41° 50′, W. 57° 0′, on the 19th had heavy s. gale with high sea, barometer 28.8 (756.9); wind afterward veered to nw. with blinding snow-squalls.

S. S. "Alexandria," W. Ramsey, commanding, had a moderate gale with heavy rain from 7 p. m. to 11 p. m., in N. 42° 16′, W. 54° 34′, on the 19th.

The following is an abstract of the log of the s. s. "Somerset," Captain James, during the 18th, 19th, and 20th:

Date.	Latitude at noon.	Longitude at noon.	Wind. Magnetic direction.	Wind. Force, 0–10.	Barometer (aneroid). *Inches.*	Barometer (aneroid). *Mill.*	Ther., Fahr.	Remarks.
	° ′	° ′					°	
Dec. 18, 8 a. m.	N. 46 48	W. 51 14	sw.	8	29.90	759.4	45	Gloomy weather and moderate sea throughout the day.
noon	.....	.....	w.	6	29.78	756.4	47	
8 p. m.	.....	.....	w.	6	29.84	757.9	43	
Dec. 19, 4 a. m	N. 45 2	W. 55 48	wnw.	6	29.94	760.5	....	7 a. m., wind accompanied by heavy rain, continuing until 7 p. m., when wind shifted suddenly to nne. and commenced to blow with terrific force, raising a tremendous sea. Barometer at time of change, 28 90 (734.0).
6 a. m.	.....	.....	n.	6	29.90	759.4	....	
8 a. m.	.....	.....	ne.	6	29.76	755.9	40	
10 a. m.	.....	.....	e.	6	29.24	742.7	.....	
noon	.....	.....	sse.	8	29.24	742.7	40	
4 p. m.	.....	.....	w.	8	28.94	735.1	.....	
8 p. m.	.....	.....	nne.	10	29.10	739.1	30	
Dec. 20, 8 a. m.	N. 43 30	W. 58 6	n.	9	29.70	754.4	18	Hard gale throughout the day, decreasing rapidly towards midnight.
noon	.....	.....	n.	8	29.93	760.2	20	
8 p. m.	.....	.....	nnw.	7	30.25	768.3	22	

The s. s. "Camden," S. R. Chandler, commanding, encountered the gale in N. 43°, W. 52°, when the barometer fell to 28.4 (721.3), at 7 p. m. of the 19th. The gale began at ese., shifting to sse. and s. then falling calm for about 40 minutes, when the wind came out from sw.; afterwards had nw. and nnw. winds with low temperature.

The British brig "Lauretta," of Charlottetown, P. E. I., whose crew was rescued by the "Camden," had experienced, when 150 miles to the northward, wind of hurricane force, from e. by n., veering to nw.

The s. s. "Aurania," W. H. P. Hains, commanding, reported as follows: "December 19th: a heavy gale set in from s. at noon in N. 45°, W. 49°, accompanied by heavy rain and lightning of dazzling brilliancy. A force of 10 was felt about midnight, and occasionally in squalls it rose to 12. The lowest barometer was 28.96 (735.6) at 10 p. m.; it began to rise at

midnight. The wind veered to west and attained its greatest force after the barometer began to rise."

By the 20th the centre of disturbance had reached N. 50°, W, 45°, having moved northeastward at no great distance from the Newfoundland coast; on this date the s. s. "Circassian," W. Richardson, commanding, had a heavy s. gale, hauling to w., with torrents of rain and very high sea, in N. 50° 10′, W. 44° 0′, and moderate to strong s. gales were reported to the eastward as far as the thirtieth meridian.

On the 22d the depression was shown near N. 52°, W. 25°; the s. s. "Wandrahm," N. J. Hundewadt, commanding, had a heavy gale from wsw. to sw. and nw., in N. 47° 30′, W. 27° 10′, lowest barometer reading 29.55 (750.6), and other vessels, between W. 25° and 15°, had moderate to strong s. gales, with barometer ranging from 29.46 (748.3) to 29.9 (759.4). A rapid increase had occurred in the barometric gradient to the westward of thirtieth meridian, so that strong nw. gales prevailed over that region.

By the 23d the depression had either filled in or moved with greatly increased pressure toward the northern coast of the British Isles.

6.—This area is a continuation of the disturbance described as low area vii. under "Areas of low barometer." During the 25th, the depression passed northeastward along the coast of Nova Scotia and over Newfoundland, and on the 26th it was to the northward of 50° N., and between W. 40° and 50°. The barometer ranged from 29.7 (744.4) to 29.9 (759.4), with strong breezes to gales from w. and sw. over the region between N. 45° and 50°, and from the eastern coast of Newfoundland to the fortieth meridian. By the 27th, the disturbance had disappeared.

7.—This disturbance occupied mid-ocean during the closing days of the month; on the 29th, there was a decrease of about .3 inch over the region north of the forty-fifth parallel, and from W. 40° eastward to W. 20°; until the close of the month, the pressure over the above region ranged from 29.23 (742.4) to 29.7 (754.4).

TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada for December, 1884, is exhibited on chart ii. by the dotted isothermal lines; and in the table of miscellaneous data are given the monthly means for the various stations of the Signal Service.

In the following table are given the averages for the several geographical districts with the normals and departures, as deduced from the Signal Service observations:

Average temperatures for December, 1884.

Districts.	Average for Dec. Signal-Service observations,		Comparison of Dec., 1884, with the average for several years.
	For several years.	For 1884.	
	°	°	°
New England	30.4	31.9	+ 1.5
Middle Atlantic states	36.7	38.1	+ 1.4
South Atlantic states	48.5	50.4	+ 1.9
Florida peninsula	62.1	64.0	+ 1.9
Eastern Gulf states	50.3	51.3	+ 1.0
Western Gulf states	50.5	48.9	— 1.6
Rio Grande valley	60.4	59.1	— 1.3
Tennessee	41.7	41.2	— 0.5
Ohio valley	35.4	34.3	— 1.1
Lower lake region	28.8	28.7	— 0.1
Upper lake region	24.6	22.9	— 1.7
Extreme northwest	11.1	5.2	— 5.9
Upper Mississippi valley	28.3	24.3	— 3.9
Missouri valley	23.7	14.2	— 9.5
Northern slope	23.6	8.5	—15.1
Middle slope	30.9	21.5	— 9.4
Southern slope	35.3	44.1	— 1.2
Southern plateau	44.3	44.0	— 0.3
Middle plateau	31.3	34.4	+ 3.1
Northern plateau	32.9	19.5	—13.4
North Pacific coast region	41.2	33.7	— 7.5
Middle Pacific coast region	48.3	49.6	+ 1.3
South Pacific coast region	55.3	53.1	— 2.2
Mount Washington, N. H	8.9	11.9	+ 3.0
Pike's Peak, Colo	6.5	5.4	— 1.1

On chart iv. the deviations from the normal temperatures are graphically exhibited by dotted lines connecting stations of equal departures.

In the districts on the Atlantic and Gulf coasts, in the middle plateau and middle Pacific coast region, the mean temperature for December has been above the normal, the stations reporting the greatest departures being as follows: Kitty Hawk, North Carolina, +3°.6; Barnegat City, New Jersey, +3°.5; New Orleans, Louisiana, +3°.4; Wilmington, North Carolina, and Salt Lake City, Utah Territory, +3°.3; Portland, Maine, Augusta, Georgia, and Winnemucca, Nevada, +3°.2.

In Texas and over the interior and northwestern portions of the country the mean temperature for the month has been below the normal, the departures being unusually large from the upper Mississippi valley westward to the Pacific coast; at stations in Montana the mean temperatures varied from 15° to 23°.3 below the normal.

DEVIATIONS FROM MEAN TEMPERATURE.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average temperatures for the various districts; in the table of miscellaneous data, and on chart iv. The following notes in connection with this subject are reported by voluntary observers:

Arkansas.—Lead Hill, Boone county: mean temperature, 29°.1 is 11°.4 below the December average for the last three years.

Dakota.—Webster, Day county: mean temperature, 9°.1, is 5°.6 below the December average for the two preceding years.

Illinois.—Mattoon, Coles county: mean temperature, 28°.5, is 2°.1 below the December average for the last four years.

Swanwick, Perry county: mean temperature, 29°.2, is 4°.7 below the December average for the last two years.

Riley, McHenry county: mean temperature, 19°.4, is 2°.4 below the December mean for the last twenty-three years.

Peoria, Peoria county: mean temperature, 27°.3, is 1°.4 below the December average for the last thirty years.

Sycamore, DeKalb county: mean temperature, 20°.5, is 7°.0 below the December average for the last three years.

Indiana.—Vevay, Switzerland county: mean temperature, 34°.0, is 0°.7 below the December average for the last twenty-one years.

Wabash, Wabash county: mean temperature, 26°.0, is 3°.9 below the December average of the last eight years.

Spiceland, Henry county: mean temperature, 27°.2, is 2°.0 below the December average for the last thirty-one years.

Iowa.—Dr. Gustavus Hinrichs, director of the State Weather Service, Iowa City, reports the mean temperature for the month to have been 5° below the normal.

Kansas.—Independence, Montgomery county: mean temperature, 25°.4, is 6° below the December average for the last thirteen years.

Emporia, Lyon county: mean temperature, 22°.4, is 7°.4 below the normal; it was 9°.5 below the December average for the four preceding years.

Lawrence, Douglas county: mean temperature, 23°.5, is 6°.3 below the December average for the last sixteen years.

Wellington, Sumner county: mean temperature, 23°.1, is 6°.9 below the December average for the last six years.

Maine.—Gardiner, Kennebec county: mean temperature, 26°.8, is 4°.4 above the December average for the last forty-nine years.

Maryland.—Fallston, Harford county: mean temperature, 34°.0, is 0°.9 above the December average for the last nine years.

Missouri—Saint Louis: mean temperature, 29°.8, is 3°.6 below the December normal.

New Hampshire.—Contoocook. Merrimack county: mean temperature, 27°.9, is nearly 4°.5 above the December average.

New Jersey.—South Orange, Essex county: mean temperature, 33°.9, is 3°.7 above the December average for the last fifteen years.

Table of comparative minimum temperatures for the month of December.

State or Territory.	Minimum for December, 1884, Signal Service.		Minimum since Signal-Service stations were opened—3 to 13 years.			Lowest from any other source.			
	Station.	Temperature.	Station.	Temperature.	Year.	Place.	Temperature.	Year.	Length of record.
		°		°			°		Years.
Alabama	Montgomery	16.0	Montgomery	8	1880	Huntsville	−7		9
Do	Mobile	20.3	Mobile	14	1880	Mobile	14		31
Arizona	Fort Apache	−8.0	Fort Apache	−2	1879	Fort Canby (old)	−25	1855	12
Do	Fort Verde	7.0	Prescott	−18	1879	Fort Whipple	−9		10
Arkansas	Little Rock	13.0	Little Rock	6	1880	Washington (near)	−6	1845	27
Do	Fort Smith	12.2	Fort Smith	9.5	1882	Fort Smith	0		21
California	Red Bluff	25.0	Red Bluff	25	1882, 1883	Fort Jones	−17	1855, 1857	3
Do	San Francisco	40.0	San Francisco	34	1879	Camp Bidwell	−10		11
Colorado	Denver	−8.0	Denver	−25	1870	Fort Garland	−30		39
Do	Pike's Peak	−20.0	Pike's Peak	−37	1878	Fort Lyon	−30	1876	20
Connecticut	New London	−5.2	New London	−1	1875, 1880	Middletown	−18	1860	11
Do	New Haven	−9.5	New Haven	−4	1880	New Haven	−11		87
Dakota	Fort Buford	−39.8	Forts Buford and Stevenson	−40	1879	Fort Stevenson	−54	1879	7
Do	Fort Bennett	−41.3	Pembina	−59	1879	Fort Totten	−51	1879	7
Delaware	Delaware Breakwater	8.9	Delaware Breakwater	1	1880	Fort Delaware	9		44
District of Columbia	Washington City	6.1	Washington City	−13	1880	Washington City	−10		48
Florida	Pensacola	23.0	Pensacola	17	1880	Fort Barrancas	15		52
Do	Key West	62.0	Key West	44	1876	Key West	48		43
Georgia	Atlanta	11.0	Atlanta	1	1880	McPherson Barracks	−1	1880	7
Do	Augusta	23.0	Augusta	7	1880	Augusta Arsenal	10		48
Idaho	Lewiston	−6.0	Lewiston	−16	1879	Fort Hall	−30	1879	10
Do	Boisé City	−7.3	Boisé City	−16	1881	Fort Lapwai	−15	1805	10
Illinois	Springfield	−8.8	Springfield	−14	1880	Rock Island Arsenal	−20		14
Do	Chicago	−11.2	Chicago	−15	1880	Chicago	−20		38
Indiana	Indianapolis	−12.3	Indianapolis	−15	1876	Wabash	−18	1880	6
Do						Spiceland	−18	1880	20
Indian Territory			Fort Sill	2	1879, 1880	Fort Sill	−11		10
Iowa	Davenport	−9.8	Davenport	−17	1876	Cresco	−35	1879	8
Do	Dubuque	−17.1	Dubuque	−19	'76, '79, 80	Dubuque	−23		11
Kansas	Dodge City	−11.8	Dodge City	−15	1876	Fort Wallace	−24	1876	8
Do	Leavenworth	−6.0	Leavenworth	−14	1880	Fort Leavenworth	−19		50
Kentucky	Louisville	−5.0	Louisville	−7	1880	Newport Barracks	−8		28
Louisiana	Shreveport	19.6	Shreveport	10	1880	Oskaloosa	10	1880	3
Do	New Orleans	28.8	New Orleans	20	1880	New Orleans	19		51
Maine	Eastport	−21.0	Eastport	−20	1875	Gardiner	−24		45
Do	Portland	−6.1	Portland	−12	1875	Portland	−13		38
Maryland	Baltimore	8.6	Baltimore	−3	1880	Emmitsburg	−19	1880	7
Do						Baltimore	4		36
Massachusetts	Boston	−9.5	Boston	−11	1875	Billerica	−20	1876	8
Do	Thatcher's Island	−7.2	Springfield	−10	1875	Williamstown	−19		55
Michigan	Escanaba	−14.1	Escanaba	−23	1880	Fort Brady	−41		58
Do	Detroit	−6.1	Detroit	−11	1880	Detroit	−13		34
Minnesota	Saint Vincent	−47.8	Saint Vincent	−42	1880	Fort Ripley	−40		14
Do	Saint Paul	−27.0	Saint Paul	−39	1879	Fort Snelling	−34		62
Mississippi	Vicksburg	18.1	Vicksburg	12	1880	Vicksburg	17	1868	3
Do						Fayette	11	1880	8
Missouri	Saint Louis	−7.0	Saint Louis	−15	1880	Rolla (near)	−23	1870	7
Do			Springfield	−4	1882	Saint Louis	−7		38
Montana	Fort Benton	−36.5	Fort Benton	−39	1880	Fort Benton	−52	1880	14
Do	Fort Assinaboine	−50.0	Fort Assinaboine	−42	1880	Camp Baker	−53	1871	9
Nebraska	Omaha	−17.0	Omaha	−17	1879	Sydney Barracks	−37	1879	5
Do	North Platte	−18.0	North Platte	−27	1879	Glendale	−30	1868	2
Nevada	Winnemucca	0.0	Winnemucca	−20	1879	Fort Halleck	−22	1879	12
New Hampshire	Mount Washington	−42.0	Mount Washington	−47	1876	Dartmouth College	−29		18
New Jersey	Sandy Hook	0.8	Sandy Hook	−7	1880	Linden	−18	1880	6
Do	Barnegat City	−0.2	Barnegat City	−7	1880	Paterson	−6	1880	15
New Mexico	Santa Fé	−2.0	Santa Fé	−13	1879	Fort Union	−28	1855	30
New York	Albany	−15.9	Albany	−17	1875	Madison Barracks	−44	1871	54
Do	Rochester	−10.5	Rochester	−8	1875, 1880	Rochester	−9		40
North Carolina	Charlotte	11.0	Charlotte	−5	1880	Lenoir	−16	1880	8
Do	Kitty Hawk	14.7	Kitty Hawk	8	1880	Fort Johnson	9		54
Ohio	Sandusky	−11.3	Sandusky	−13	1880	Kenton	−20	1876	3
Do	Columbus	−7.9	Cleveland and Columbus	−12	1880	College Hill	−12	1880	65
Oregon	Roseburg	19.2	Roseburg	7	1879	Eola	−8	1879	7
Do	Portland	12.0	Portland	3	1879	Fort Dalles	−6		16
Pennsylvania	Erie	5.9	Erie	−11	1880	Lewisburg	−23	1805, 1807	6
Do	Philadelphia	0.8	Philadelphia	−5	1880	Philadelphia	3		123
Rhode Island	Block Island	−3.2	Newport	−3	1875	Providence	−12		36
South Carolina	Charleston	26.0	Charleston	13	1880	Aiken	3	1880	7
Do						Charleston	20		104
Tennessee	Nashville	0.9	Nashville	−2	1876	Clarksville	−4	1880	8
Do	Knoxville	5.2	Knoxville	−5	1880	Humboldt	−3		4
Texas	Fort Stockton	13.8	Fort Stockton	8	1880	Camp Stockton	−9	1859	15
Do	Fort Elliott	−2.0	Fort Elliott	−10	1879	Fort Griffin	−7	1870	4
Utah	Salt Lake City	6.6	Salt Lake City	−10	1879	Fort Crittenden	−22	1859	3
Do						Camp Douglas	−8	1879	20
Vermont			Burlington	−19	1879	Lunenburg	−30	1868	20
Virginia	Lynchburg	5.5	Lynchburg	−5	1880	Alexandria	12		11
Do	Norfolk	12.2	Norfolk	9	1880	Fortress Monroe	17		48
Washington Territory	Olympia	8.0	Olympia	8	1879	Fort Colville	−22		21
Do	Dayton	−26.0	Dayton	0.0	1880	Fort Townsend	−22	1872	15
West Virginia			Morgantown	−9	1880	Flemington	−21	1880	2
Wisconsin	La Crosse	−26.0	La Crosse	−26	1879	Fort Howard	−38		31
Do	Milwaukee	−21.6	Milwaukee	−21	1880	Milwaukee	−19		12
Wyoming	Cheyenne	−13.4	Cheyenne	−24	1879, 1880	Fort Fetterman	−36		14
Do	Fort Bridger	−5.6	Fort Washakie	−27	1882	Fort Bridger	−28		16

New York,—North Volney, Oswego county: mean temperature, 26°.5, is 0°.9 above the December average for the last seventeen years.

Palermo, Oswego county: mean temperature, 23°.5, is 0°.9 below the December average for the last thirty-one years.

Ohio.—Wauseon, Fulton county: mean temperature, 24°.5, is 2°.2 below the December average for the last fourteen years.

Pennsylvania.—Dyberry, Wayne county: mean temperature, 27°.5, is 2°.5 above the December average for the last twenty years.

Vermont.—Woodstock, Windsor county: mean temperature, 21°.8, is 2°.2 above the December average for the last seventeen years.

Virginia.—Wytheville, Wythe county: mean temperature,

38°.3, is 3°,2 above the December average for a period of twenty years.

Variety Mills, Nelson county: mean temperature, 38°.1, is 1°.4 above the December average for the last eight years.

Washington Territory.—Bainbridge Island: mean temperature, 33°, is the lowest December average for the last seven years.

West Virginia.—Helvetia, Randolph county: mean temperature, 35°.8, is 2°.2 above the December average for the last eight years.

RANGES OF TEMPERATURE.

The monthly and daily ranges of temperature at the various Signal Service stations are shown in the table of miscellaneous meteorological data. The monthly ranges were unusually large in Montana, the following stations reporting ranges exceeding 100°: Poplar River, 100°.1; Fort Custer, 105°.5; Fort Shaw, 106°.7; Fort Assinaboine, 113°.8; Fort Benton, 125°.7.

The smallest monthly ranges are: 20° at Key West, Florida, and 24° at San Francisco, California.

LOW TEMPERATURES.

The following notes relating to the low temperatures of December, 1884, have been reported:

Colorado.—West Las Animas: on the 24th the temperature fell to —6°.6, and on the 31st it fell to —21°.5.

Dakota.—Fort Bennett: the minimum temperature of the 25th was —41°.3; the lowest previously recorded since 1880 was —42° in January, 1883.

Florida.—Pensacola, 19th: the first ice of the season formed on this date; the temperature fell to 23°, which is the lowest recorded since this station was opened in 1879, with one exception, viz.: 17° on December 30th, 1880.

Illinois.—Chicago: on the 18th the temperature remained below zero all day, the daily mean being —6°.6; on the morning of the 19th the lowest temperature recorded was —11°.2.

Iowa.—Des Moines: on the 18th the temperature did not rise above zero, and on the a. m. of the 19th the thermometer registered —18°.2, being the lowest that has been recorded in December since Signal Service observations were begun in 1878.

Maine.—Portland: intensely cold weather prevailed in the northern and central portions of the state on the 27th, the following temperatures being reported: from —22° to —26° at Buckfield, Canton, Farmington, Strong, and Waterville; and —35° at Farmington Falls.

Eastport: the minimum temperature, —21°, on the morning of the 20th, is the lowest recorded since the establishment of this station in 1874; in January, 1874, and December, 1875, the temperature fell to —20°, being the next lowest on the record.

Bangor: on the morning of the 20th thermometers in various localities in this vicinity showed temperatures ranging from —20° to —24°; at noon the temperature was about zero, and at night it had fallen to —10°; on the morning of the 21st it was —6°, and rose rapidly during the day. On the 27th temperatures varying from —10° to —15° were recorded, and reports from Holton, ninety miles north, state that the temperature fell to —35°.

Michigan.—Hudson: the night of the 17–18th was the coldest that has been experienced for the last fifteen years, the temperature falling to —28°.

Minnesota.—Saint Paul: on the 25th the temperature was stationary at —27° from 5.56 to 9.30 a. m. A self-registering thermometer attached to a wooden box and exposed on the roof of the building recorded a temperature of —36°.5.

Montana.—Fort Assinaboine: the minimum temperatures on the 24th and 25th, —47°.2 and —50°.0, are the lowest of which there is a record; mercury froze on the 22d, 24th, and 25th.

Fort Benton: the minimum temperature on the 24th, —56°.5, is, with the exception of —59° in 1880, the lowest on the records of this office.

In the following table are shown the daily extremes and the mean temperatures at the coldest stations in Minnesota, Dakota, and Montana. As the cold weather set in about the middle of the month, the means for the first fifteen days and for the last sixteen days of the month are given separately. A comparison of the means for the first and second portions of the month shows remarkable ranges, varying from 32°.8 at Fort Totten to 43°.8 at Fort Benton:

Dates.	Fort Assinaboine, Mont.			Fort Benton, Mont.			Fort Custer, Mont.			Fort Shaw, Mont.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
1	63.8	44.4	38.9	69.2	36.1	43.2	54.1	29.3	34.7	62.2	45.3	38.8
2	51.4	31.1	35.2	69.2	27.9	39.6	58.0	26.2	38.2	52.5	36.8	36.8
3	50.1	33.7	35.2	53.8	37.2	41.0	55.7	34.9	38.1	50.0	32.0	34.2
4	46.4	32.3	33.5	50.8	29.2	36.7	49.7	34.3	35.4	46.0	28.5	32.7
5	45.3	29.3	33.0	47.2	35.4	38.1	52.0	24.1	32.7	46.0	33.5	42.2
6	38.4	19.8	24.3	37.5	20.8	24.7	40.1	24.0	26.6	33.5	20.0	26.0
7	32.0	13.6	23.2	32.2	10.1	21.5	33.1	17.8	21.0	29.0	6.5	19.2
8	40.8	27.2	31.4	39.9	24.2	27.1	42.8	8.0	21.8	35.5	26.2	24.5
9	39.8	19.7	28.5	39.3	20.1	24.2	39.3	14.0	26.0	35.0	23.5	25.0
10	37.2	10.9	21.0	41.6	11.5	18.8	36.7	18.8	23.2	34.0	8.7	15.8
11	22.3	9.1	15.4	17.8	4.3	10.7	27.8	9.1	16.2	17.0	6.0	13.2
12	21.6	11.7	17.2	19.2	12.2	12.9	18.9	9.0	13.7	18.0	13.0	13.8
13	19.5	10.9	15.3	16.5	5.2	8.5	22.2	12.9	15.8	14.5	0.5	4.8
14	15.8	—10.8	1.1	11.6	— 7.2	2.3	17.0	2.8	10.0	10.5	— 6.5	1.2
15	— 7.9	—21.2	—13.0	— 4.5	—22.2	—13.8	5.0	—20.0	—13.8	— 6.5	—28.0	—17.1
Means	34.4	17.5	22.7	36.1	16.3	22.4	36.8	16.3	22.0	31.8	16.3	20.1
16	— 3.4	—27.0	—11.7	— 9.3	—25.9	—15.1	— 4.0	—27.0	—14.1	—16.5	—29.8	—22.6
17	— 7.0	—25.0	—16.2	— 1.8	—20.9	—11.0	1.0	—16.0	— 7.0	— 3.5	—20.8	—10.7
18	— 7.7	—27.1	—12.8	— 7.3	—16.1	—11.3	0.0	—12.0	— 5.3	— 0.5	—15.5	—10.3
19	— 3.0	—15.3	— 8.4	0.2	—12.8	— 6.9	1.0	— 5.9	— 2.8	— 6.5	—10.5	— 8.6
20	— 8.7	—29.5	—17.8	— 6.8	—30.1	—20.7	— 0.8	—16.0	— 8.7	— 7.5	—34.0	—21.0
21	—17.7	—32.3	—24.3	—12.6	—31.8	—26.7	— 5.0	—20.0	—15.3	—15.0	—34.0	—28.3
22	—21.1	—42.2	—29.4	—24.5	—47.5	—34.8	—13.7	—24.9	—17.7	—19.0	—41.0	—28.0
23	—13.9	—28.9	—20.9	—14.9	—39.5	—27.7	—13.3	—39.0	—26.0	—15.0	—39.0	—25.4
24	—25.0	—47.2	—36.8	—29.2	—56.5	—44.3	—24.2	—47.5	—36.6	—24.0	—44.5	—32.9
25	— 7.8	—50.0	—20.4	— 4.5	—47.6	—20.7	— 1.5	—36.0	—16.2	30.5	—24.0	2.7
26	— 1.0	—13.0	— 3.3	1.5	—11.4	— 5.2	3.0	— 7.9	— 0.8	— 1.5	— 8.0	— 6.1
27	1.6	—18.4	— 8.4	0.2	—24.5	—11.2	3.1	— 2.0	— 0.4	— 2.0	—25.0	—14.7
28	—11.0	—37.5	—19.0	—10.1	—37.4	—23.7	2.1	—15.0	—10.2	—14.0	—25.0	—20.0
29	—11.0	—28.5	—15.7	—11.5	—35.4	—24.8	—11.0	—26.0	—18.9	—14.0	—26.5	—21.7
30	—13.0	—38.9	—25.2	—16.2	—40.2	—30.1	— 3.5	—25.0	—14.8	—12.0	—28.0	—22.8
31	—18.4	—46.6	—26.9	—17.6	—46.2	—28.2	—13.5	—34.0	—22.7	— 6.0	—25.0	—11.4
Means	—10.5	—31.7	—18.6	—10.3	—32.7	—21.4	— 5.0	—22.1	—13.6	— 8.3	—27.1	—18.0

Dates.	Poplar River, Mont.			Fort Buford, Dak.			Fort Totten, Dak.			Saint Vincent, Minn.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min	Mean.	Max.	Min.	Mean.
1	50.9	29.4	36.4	56.8	32.7	38.3	42.1	27.5	34.1	36.5	17.8	27.1
2	49.9	28.1	34.6	48.4	28.8	37.0	43.0	31.0	35.7	44.8	26.2	35.4
3	48.9	26.7	35.8	46.8	29.7	35.6	41.0	26.3	32.2	44.8	30.8	33.6
4	45.8	26.0	33.8	41.1	28.9	31.9	38.0	20.3	28.9	37.7	16.2	27.0
5	48.3	22.9	30.9	41.8	27.5	32.5	41.2	22.8	32.5	38.7	18.8	29.0
6	29.9	18.9	24.0	39.9	25.1	26.8	36.0	26.0	28.2	34.5	26.3	28.8
7	18.9	0.1	13.4	26.0	11.2	15.7	28.8	16.0	22.1	30.8	18.0	24.2
8	37.4	9.6	21.2	37.5	12.1	28.2	21.5	4.0	13.0	28.7	3.9	12.6
9	34.3	14.9	25.1	37.1	23.8	29.3	35.0	6.5	24.8	31.3	0.9	20.9
10	29.5	15.9	20.7	30.0	13.0	17.4	28.5	2.5	12.2	29.1	13.1	16.9
11	18.8	— 1.9	4.0	18.1	0.0	3.5	13.0	— 3.0	6.4	16.7	5.0	9.5
12	10.4	—11.2	— 0.1	8.8	1.0	5.3	9.0	3.0	6.2	14.1	3.9	9.6
13	19.8	5.1	11.8	22.2	8.1	12.9	21.0	1.0	12.4	21.7	— 0.4	11.5
14	6.4	—11.3	— 2.3	12.4	— 7.5	1.8	18.0	— 7.2	0.8	19.4	— 9.4	0.0
15	—10.5	—22.8	—16.8	— 7.0	—17.0	—14.0	— 6.1	—21.0	—16.2	— 8.2	—20.0	—15.0
Means	29.4	10.0	18.2	30.7	14.5	20.1	27.3	10.4	18.2	28.0	10.1	18.1
16	— 6.9	—22.7	—15.9	— 5.5	—18.5	—11.0	— 9.0	—20.5	—13.4	— 6.3	—22.3	—14.4
17	—12.8	—33.3	—24.1	— 5.5	—26.3	—18.0	— 9.0	—28.0	—21.6	—12.2	—27.4	—23.9
18	—10.0	—40.3	—23.0	— 9.9	—30.0	—18.5	—14.0	—34.0	—22.3	—19.2	—30.2	—24.0
19	2.5	—12.3	— 4.1	1.2	—11.8	— 3.2	— 1.0	—24.4	— 6.2	0.8	—25.8	— 6.5
20	— 3.6	—21.1	—18.2	2.2	—19.5	—10.5	3.0	—19.0	— 9.2	6.2	—16.7	— 5.0
21	—15.5	—39.4	—27.6	— 8.7	—34.0	—24.1	—11.8	—28.5	—18.4	—12.5	—27.4	—18.2
22	—28.3	—46.2	—35.8	—18.8	—39.8	—28.6	—25.0	—34.5	—28.7	—19.5	—38.2	—32.4
23	—21.1	—31.9	—27.7	—15.8	—30.6	—24.3	—20.0	—34.0	—23.9	—22.0	—47.8	—35.8
24	—27.8	—45.1	—38 7	—19.6	—39.3	—27.9	—21.0	—34.0	—25.5	—12.1	—42.8	—26.6
25	— 5.0	—49.2	—21.1	— 4.3	—39.1	—13.7	— 4.0	—29.5	—12.1	— 8.8	—35.9	—20.3
26	— 5.2	—20.7	—13.0	— 1.5	—10.0	— 6.3	3.5	— 9.6	0.4	7.8	—10.0	— 1.4
27	— 2.8	—14.3	— 9.6	— 4.8	—12.1	— 4.7	12.0	— 2.3	5.1	14.0	— 7.5	2.2
28	—14.3	—30.2	—23.9	— 5.8	—18.4	—13.3	2.2	— 6.0	— 1.6	— 7.2	—14.1	— 3.8
29	—14.8	—33.2	—25.8	—10.3	—26.1	—20.8	— 2.6	—23.0	—13.0	0.2	—20.0	—11.3
30	—22.5	—36.1	—29.7	—15.5	—31.1	—23.6	—11.0	—22.0	—14.7	— 8.9	—31.8	—20.0
31	—33.2	—44.6	—39.8	—24.8	—39.6	—34.5	—13.0	—35.0	—28.0	—12.8	—38.2	—30.7
Means	—14.0	—32.5	—23.6	— 7.9	—26.6	—17.7	— 7.5	—24.0	—14.6	— 6.2	—27.3	—17.0

New York.—Rome, Oneida county: the temperature fell to —22° on the morning of the 20th.

Lyons, Wayne county: the 20th was the coldest day known

in this section for many years; at 4 a. m. the thermometer indicated —22°.

Watertown, Jefferson county: the weather on the 20th and 21st, throughout northern New York, was the coldest known for many years. At this place the temperature fell to —28° on the 20th, and to —38° on the 21st; at other points in the county it fell to —40°.

Oswego: the minimum temperature, —17°.5 on the 20th, is the lowest recorded since the opening of the signal office here, in 1871.

Rochester: the minimum temperature, —10°.5, on the morning of the 20th is the lowest recorded in December since Signal Service observations were begun in 1871; lower temperature than the above has occurred in two instances only, viz: —12° in January, 1873, and the same in February, 1875.

North Carolina.—Charlotte: weather very cold on the 19th; minimum temperature, 11°; plants in the hot-houses were killed.

Fort Macon: on the 19th, the temperature fell to 15°.2; on the 20th, ice was two inches thick.

Scott's Hill, 19th: weather very cold, minimum temperature, 11°.

South Carolina.—Charleston: the fountains and pumps in the city froze on the 19th.

Virginia.—Cape Henry: the minimum temperature on the 20th, 15°.3, is the lowest with two exceptions, viz: 12° in 1876 and 7° in 1880, that has been recorded since this station was opened in 1873.

Washington Territory.—Dayton: on the 31st the temperature fell to —26°, being the lowest temperature yet recorded here; observations were begun in 1880.

Wisconsin.—La Crosse: minimum temperature on the 25th was —26°, at 8 a. m.; this has been equalled in December in but an instance, viz: in 1876, since the station was established, in 1873.

Wyoming.—Cheyenne: on the afternoon of the 15th the temperature fell from 32° to —8° in four hours, and on the 23d it fell from 42° at 2 p. m. to —12° at 6 p. m.; a range of 54°. On the 16th the daily mean temperature was —7°.0, the lowest being —13°.4.

FROSTS.

Frosts occurred in the various districts on the following dates:

New England.—1st to 28th.

Middle Atlantic states.—1st to 11th, 13th, 14th, 16th to 28th, 30th.

South Atlantic states.—1st to 4th, 8th, 9th, 10th, 13th, 16th to 28th.

Florida peninsula.—Sanford, 3d; Cedar Keys, 19th, 30th; Archer, 2d, 3d, 10th, 19th, 20th; Tallahassee, 19th; Limona, 3d; Newport, 2d, 3d, 19th, 20th, Manatee, 3d, 4th.

East Gulf states.—1st, 2d, 3d, 8th, 9th, 16th, 18th, 19th, 20th, 21st, 25th, 26th.

West Gulf states.—1st to 4th, 6th, 7th, 8th, 12th, 13th, 15th, 16th, 18th, 19th, 26th, 31st.

Tennessee.—1st to 5th, 7th to 10th, 12th, 13th, 14th, 16th to 20th, 22d to 28th, 31st.

Ohio valley.—1st to 5th, 8th, 9th, 10th, 13th, 14th, 18th, 19th, 20th, 25th, 26th, 27th.

Lower lake region.—1st to 10th, 19th, 20th, 23d, 25th, 26th, 27th.

Upper lake region.—1st to 4th, 9th to 27th, 30th, 31st.

Extreme northwest.—1st to 31st.

Upper Mississippi valley.—1st to 5th, 8th to 27th, 31st.

Missouri valley.—1st to 31st.

Northern slope.—1st to 18th, 20th to 31st.

Middle slope.—1st to 4th, 8th to 18th, 20th to 31st.

Southern slope.—1st, 2d, 3d, 7th, 9th, 11th, 12th, 15th, 16th, 17th, 19th, 20th, 21st, 25th, 26th, 27th.

Southern plateau.—1st to 31st.

Middle plateau.—1st to 6th, 8th, 10th, 11th, 28th to 31st.

Northern plateau.—1st to 18th, 27th to 31st.

North Pacific coast region.—1st to 13th, 15th.

Middle Pacific coast region.—1st to 6th, 9th to 16th, 27th, 29th, 30th, 31st.

South Pacific coast region.—Los Angeles, California, 2d, 3d, 6th, 13th to 17th; Poway, California, 1st, 2d, 3d, 14th to 17th, 30th.

ICE.

Ice formed at stations in the South, during December, as follows:

Jacksonville and Pensacola, Florida, 19th.
Wilmington, North Carolina, 19th.
Augusta, Georgia, 19th, 20th.
New Orleans, Louisiana, 19th.
Galveston, Texas, 18th.
Indianola, Texas, 18th, 26th.
Brownsville, Texas, 25th, 26th.
Fort Stockton, Texas, 12th, 18th, 19th, 25th, 26th.

PRECIPITATION.

[*Expressed in inches and hundredths.*]

The distribution of rainfall over the United States and Canada, for the month of December, 1884, as determined by the reports from more than seven hundred stations, is exhibited on chart iii.

In the following table are shown, for each of the geographical districts, as deduced from Signal Service observations, the average December precipitation for a series of years; the average for December, 1884, and the departures from the normal.

Average precipitation for December, 1884.

Districts.	Average for Dec., Signal-Service observations.		Comparison of Dec., 1884, with the average for several years.
	For several years.	For 1884.	
	Inches.	*Inches*	*Inches.*
New England	3.32	6.11	+2.79
Middle Atlantic states	3.42	5.55	+2.13
South Atlantic states	4.36	4.69	+0.33
Florida peninsula	2.49	3.79	+1.30
Eastern Gulf states	5.36	7.10	+1.74
Western Gulf states	3.93	9.91	+5.98
Rio Grande valley	1.94	0.83	—1.11
Tennessee	4.42	6.46	+2.04
Ohio valley	3.67	5.16	+1.49
Lower lake region	2.86	2.96	+0.10
Upper lake region	2.50	4.89	+2.39
Extreme northwest	0.92	0.99	+0.07
Upper Mississippi valley	1.96	4.24	+2.28
Missouri valley	0.78	0.82	+0.04
Northern slope	0.94	1.09	+0.15
Middle slope	0.64	1.17	+0.53
Southern slope	0.73	1.77	+1.04
Southern plateau	1.05	3.91	+2.86
Middle plateau	1.14	2.70	+1.56
Northern plateau	3.30	4.21	+0.91
North Pacific coast region	8.16	7.51	—0.65
Middle Pacific coast region	4.26	8.61	+4.35
South Pacific coast region	2.08	3.88	+1.80
Mount Washington, N. H.	5.46	4.70	—0.76
Pike's Peak, Colo.	1.24	1.50	+0.26

With the exception of the north Pacific coast region, Rio Grande valley, and at a few scattering stations in other districts, the precipitation for December has been excessive throughout the United States.

In the upper Mississippi valley, west Gulf states, southern plateau, and in the middle Pacific coast region, it has been exceptionally heavy, being more than double the average in these districts.

Decided excesses over the average also occurred in the upper lake region, New England, middle Atlantic states, Tennessee, Ohio valley, east Gulf states and Florida, the departures varying from 1.30 in Florida to 2.79 in New England. At Little Rock, Arkansas, the monthly precipitation was 16.92, or an excess of 13.40 over the December average for the four preceding years; at Shreveport, Louisiana, it was 15.55, or an excess of 10.91 as compared with the average for the last

eleven years; at Sacramento it was 10.45, the average for December during the last seven years being 3.05; at Olympia, Washington Territory, it was 5.52, or a deficiency of 4.34 as compared with the average for the seven preceding years. In the table of miscellaneous meteorological data are given the monthly precipitation for the several stations, with the departures from the average.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of averages for the several districts, and in the table of miscellaneous meteorological data. The following notes in connection with this subject are reported by voluntary observers:

Arkansas.—Lead Hill, Boone county: monthly precipitation, 11.37, is 7.95 in excess of the average for the three preceding years.

Mount Ida, Montgomery county: monthly precipitation, 15.95, is more than double the amount for any December in the last thirteen years, with one exception, viz: in 1874, when it was 10.10.

California.—San Francisco: monthly precipitation, 7.68, is 2.47 in excess of the December average for a period of thirty-four years.

Poway, San Diego county: monthly precipitation, 5.91, is 3.70 above the December average for the last six years.

Illinois.—Mattoon, Coles county: monthly precipitation, 5.45, is 2.85 above the December average for the last four years.

Swanwick, Perry county: monthly precipitation, 5.78, is 3.59 above the December average for the last three years.

Riley, McHenry county: monthly precipitation, 3.28, is 1.35 above the December average for the last twenty-four years.

Sycamore, DeKalb county: monthly precipitation, 4.18, is 1.56 above the December average for the last three years.

Indiana.—Wabash, Wabash county: monthly precipitation, 5.44, is 2.65 above the December average for the last nine years.

Vevay, Switzerland county: monthly precipitation, 3.83, is 0.32 below the December average for the last twenty-one years.

Spiceland, Henry county: monthly precipitation, 6.47, is 3.30 above the December average for the last twenty-four years.

Kansas.—Independence, Montgomery county: monthly precipitation, 3.34, is 0.83 above the December average for the last twelve years.

Emporia, Lyon county: monthly precipitation, 1.81, is 0.69 above the December average for the last five years.

Lawrence, Douglas county: monthly precipitation 2.55 is 0.96 above the December average for the last sixteen years.

Maine.—Gardiner, Kennebec county: monthly precipitation 5.04, is 1.26 above the December average for the last forty-nine years.

Maryland.—Fallston, Harford county: monthly precipitation, 6.06, is 2.66 above the December average for the last fourteen years.

Nevada.—Carson City, Ormsby county: monthly precipitation, 4.75, is 2.56 in excess of the December average for the last five years.

New Hampshire.—Antrim, Hillsborough county: monthly precipitation, 5.10, is 1.39 above the average for the last twelve years.

Contoocook, Merrimac county: monthly precipitation, 4.50, is 2.00 in excess of the December average.

New Jersey.—South Orange, Essex county: monthly precipitation, 5.40, is 1.52 above the December average for the last fifteen years.

New York.—North Volney, Oswego county: monthly precipitation, 3.50, is 0.12 above the December average for the last thirteen years.

Palermo, Oswego county: monthly precipitation, 3.42, is 0.70 below the December average for the last thirty-one years.

Ohio.— Wauseon, Fulton county: monthly precipitation, 3.38, is 1.16 above the December average for the last twelve years.

The following table, showing the monthly and annual precipitation, from 1859 to 1884, both inclusive, at Portsmouth, Scioto county, has been prepared by Dr. D. B. Cotton, of that place. From this table it will be seen that the precipitation for December, 1884, exceeds the average by 1.00:

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for year.
1859	2.33	7.20	3.09	8.34	1.43	4.21	1.22	6.70	1.29	2.32	2.09	6.15	46.37
1860	3.94	1.05	1.01	4.24	3.59	1.90	3.96	2.57	3.18	1.58	4.64	2.25	33.91
1861	3.10	2.60	1.81	5.35	5.99	2.15	1.40	5.45	3.19	3.40	5.86	1.64	41.94
1862	7.25	4.08	4.98	6.15	1.56	3.34	1.81	2.50	1.16	1.50	2.26	2.60	39.19
1863	6.22	3.48	4.43	2.01	1.34	1.76	4.32	4.15	1.52	3.16	2.14	2.24	36.77
1864	1.92	1.45	2.68	2.26	3.29	2.94	1.00	4.11	2.35	3.05	5.52	4.34	34.91
1865	2.65	3.15	5.90	3.95	10.59	4.30	6.17	2.00	6.03	1.15	1.15	6.53	53.57
1866	4.61	3.07	3.69	2.87	1.33	2.93	4.72	2.82	9.29	3.41	4.82	1.51	45.07
1867	2.95	5.96	7.11	1.37	4.64	1.48	4.33	4.32	.72	5.57	2.09	4.47	45.01
1868	1.81	.95	3.83	4.71	6.26	4.40	2.97	4.45	9.00	1.64	1.85	3.20	45.07
1869	2.82	2.52	4.57	4.22	3.86	4.70	4.20	2.21	3.48	2.28	3.82	3.16	41.84
1870	4.92	3.68	3.82	3.48	1.34	3.17	7.54	4.95	.75	2.99	2.18	2.04	40.86
1871	2.57	3.96	2.50	2.69	1.80	2.59	3.65	2.20	1.32	2.59	2.00	2.58	30.51
1872	.78	2.25	1.14	8.37	3.08	1.89	6.10	1.81	1.32	1.20	1.18	2.01	31.13
1873	1.60	4.87	3.01	1.97	4.75	3.48	7.12	4.98	2.58	4.95	1.94	4.94	46.19
1874	4.63	3.70	2.62	5.38	1.18	3.46	6.22	1.94	2.50	.24	3.64	2.80	38.31
1875	2.12	1.52	5.36	1.99	3.50	5.81	8.75	3.28	1.73	2.26	5.06	4.33	45.71
1876	4.25	2.47	4.45	2.53	1.00	3.69	6.75	3.54	5.60	1.82	3.67	1.45	41.22
1877	5.16	.39	5.10	2.89	1.97	3.60	5.11	1.39	2.20	1.79	2.44	3.24	35.01
1878	2.96	1.36	3.90	1.37	1.96	2.39	1.42	2.92	2.73	2.06	3.16	3.66	29.89
1879	3.19	2.73	3.29	.42	3.14	4.31	1.25	4.79	2.41	1.49	1.53	7.01	35.56
1880	4.05	5.80	4.56	5.94	2.03	4.65	2.85	5.54	3.99	2.90	3.05	3.61	48.97
1881	4.32	2.41	3.02	3.24	1.76	3.60	3.80	2.06	2.45	4.37	3.70	5.17	40.80
1882	8.82	6.28	4.19	3.09	8.49	6.85	3.44	6.69	3.66	1.72	1.30	1.68	56.21
1883	3.54	8.07	3.40	4.50	3.59	4.15	4.13	.82	1.46	6.47	3.08	5.36	48.57
1884	5.34	6.11	5.55	3.90	4.89	3.47	2.45	1.35	1.87	1.22	1.46	4.70	42.31
Mean	3.92	3.68	3.99	3.88	3.43	3.65	4.27	3.58	3.11	2.69	3.03	3.70	43.00

Monthly mean for 25 years, 3.58.

Oregon.—Mr. Thomas Pearce, voluntary observer at Eola, Polk county, reports that the total snowfall for December was 60.8 inches, and states that during a residence of thirty-four years at Eola, he has, at no time, seen as much snow as fell during December, 1884; at the close of the month the snow was eighteen inches deep.

Dr. George Wigg, of East Portland, reports: "the most snow since 1861; twenty miles from station the snow has drifted to depths of fifty feet."

Pennsylvania.—Dyberry, Wayne county: monthly precipitation, 3.74, is 1.17 above the December average for the last sixteen years. The monthly snowfall, fourteen inches, is about the average for December during the last twenty years.

Vermont.—Woodstock, Windsor county: monthly precipitation, 4.09, is 1.14 above the December average for the last sixteen years.

Virginia.—Wytheville, Wythe county: monthly precipitation, 3.02, is 0.10 above the December average for a period of twenty years.

Variety Mills, Nelson county: monthly precipitation, 4.74, is 0.98 above the December average for the last six years.

West Virginia.—Helvetia, Randolph county: monthly precipitation, 4.30, is 0.40 below the December average for the last eight years.

SNOW.

The dates on which snow fell in the various districts are as follows:

New England.—8th to 19th, 21st to 28th.

Middle Atlantic states.—2d, 9th, 11th to 21st, 23d to 27th.

South Atlantic states.—Atlanta, Georgia, 18th; Wash Woods, North Carolina, 18th to 21st, 26th; Kitty Hawk, North Carolina, 19th, 20th.

East Gulf states.—Vicksburg, Mississippi, 18th.

West Gulf states.—Fort Smith, Arkansas, 13th, 17th, 31st.

Tennessee.—Memphis, 17th, 18th; Knoxville, 18th, 25th, 26th; Nashville, 17th, 18th, 25th, 26th; Chattanooga, 18th.

Ohio valley.—1st, 9th, 11th to 25th, 31st.

Lower lake region.—1st, 8th to 26th, 31st.

Upper lake region.—1st, 5th to 31st.

Extreme northwest.—6th to 15th, 18th to 23d, 25th to 28th, 30th.

Upper Mississippi valley.—1st, 6th, 7th, 11th to 31st.
Missouri valley.—6th, 7th, 12th to 23d, 25th to 31st.
Northern slope.—4th to 31st.
Middle slope.—4th, 6th, 7th, 10th to 15th, 17th, 18th, 20th to 30th.
Southern slope.—Fort Stanton, New Mexico, 4th, 10th to 13th, 26th; Fort Davis, Texas, 11th; Fort Concho, Texas, 15th.
Southern plateau.—4th, 8th, 10th to 14th, 25th to 30th.
Middle plateau.—3d, 5th, 6th, 10th to 22d, 26th to 30th.
Northern plateau.—2d to 6th, 10th to 29th, 31st.
North Pacific coast region.—13th to 23d, 25th to 28th, 31st.
Middle Pacific coast region.—Red Bluff, California, 17th, 20th.

Snow-storms of unusual severity, interrupting travel, etc., have been reported as follows:

Concord, New Hampshire, 25th: the snow has drifted to such an extent on the northern and White mountain division of the Boston and Lowell railroad as to delay trains for several hours.

Oswego, New York, 18th: trains were snow bound on the Rome, Watertown and Ogdensburg railroad on the 17th. Snow was reported to have been three feet deep.

Grand Haven, Michigan, 22d: the snow-storm of this date was accompanied during the afternoon by a strong westerly wind which caused the snow to drift so as to seriously interrupt railroad traffic. Nearly all trains were delayed from two to three hours on the 23d.

Duluth, Minnesota, 31st: snow began at 7.30 a. m., accompanied by a high northwesterly wind, which caused the snow to drift to depths of from three to four feet.

Fort Assinaboine, Montana: a snow-storm, accompanied by high northwesterly winds, prevailed on the 19th. The mail was delayed for several hours in consequence of snow-drifts.

Pike's Peak, Colorado: a blinding snow-storm prevailed during the 21st and 22d; on the latter date the snow drifted half way to the roof of the observatory.

Denver, Colorado, 23d: snow blockades have occurred on both the San Juan branch and the Utah line of the Denver and Rio Grande railroad. Reports from Leadville on the above date stated that the snow at that place was three feet deep on the level, and was drifted badly. Many poorly constructed cabins were crushed beneath the weight of snow.

The following is from the "Chicago Times" of December 27th:

DENVER, COLO., *December*, 26th.—Continued storms and increasing drifts are reported from many points in the mountains. Leadville is nearly buried in the snow. The stores are reached by deep cuts through the drifts and the main floors have the character of cellars in their relation to the level outside. Railway communication with that city is kept open only by the constant use of snow plows and an army of shovelers, while the branches from that city are buried and the points to which they run are completely isolated. In the Monarch district of Chaffee county, near Marshall Pass, the average depth is given at ten feet, with many drifts of greater depth. Families are buried in their houses with limited food supplies.

Salt Lake City, Utah: one of the severest snow storms ever experienced here prevailed from the morning of the 21st until the morning of the 22d; nearly all trains due here were delayed and business was seriously interrupted.

Portland, Oregon, 25th: the recent snow-storms have caused a blockade between this place and Dalles. No eastern mail has arrived since the 15th.

San Francisco, California, 24th: a blockade has occurred at Redding, California, cutting off railroad communication between Portland, Oregon, and San Francisco. The superintendant of the railway mail service, owing to snow blockades on the Northern Pacific railroad, has ordered all mail for the east, accumulating at Portland, to be sent to San Francisco by steamer to be forwarded.

MONTHLY SNOW-FALLS.

[*Expressed in inches and tenths.*]

Monthly snow-falls of 3 inches or more were reported from the various states and territories during the month as follows:

Arizona.—Fort Grant, 15.0; Pantano, 5.0; San Simon, 3.0.
California.—Summit, 94.0; Cisco, 59.0; Emigrant Gap, 36.8; Truckee, 24.0; Delta, 15.0; Boca, 8.0; Keeler, 7.0; Bishop Creek, 4.5; Alta and Keen, 4.0; New Hall, 3.0.
Colorado.—Pike's Peak, 44.5; West Las Animas, 10.6; Pueblo, 7.8; Denver, 7.4; Fort Collins, 4.2.
Connecticut.—North Colebrook, 18.8; Southington, 14.5; Middletown, 13.5; New London, 13.2; Bethel, 12.6; Wallingford, 12.5; New Haven, 10.4; Norfolk, 10.0; Hartford, 9.6; Voluntown, 9.0.
Dakota.—Fort Totten, 13.7; Yankton, 13.4; Deadwood, 12.9; Vermilion, 11.0; Richardton, 8.4; Fort Bennett, 7.4; Webster, 6.7; Huron, 5.3; Fort Buford, 4.7.
District of Columbia.—Washington City, 4.4.
Idaho.—Boisé City, 37.0; Lewiston, 26.6.
Illinois.—Greenville, 18.5; Rockford, 12.2; Bunker Hill, 11.3; Marengo and Riley, 11.2; Prairieville, 10.5; Sycamore, 10.3; Mattoon, 9.7; Griggsville, 9.4; Aurora, 9.1; Chicago, 8.8; Springfield, 8.2; Wilton Centre, 8.0; Mascoutah, 6.9; Edgington, 6.0; Swanwick, 5.5; Peoria, 5.0; Pana, 4.9; Anna, 4.8; McLeansboro, 3.8.
Indiana.—Logansport, 21.8; Monticello and Lafayette, 18.5; Wabash, 18.2; Attica, 18.0; Fort Wayne, 17.2; Noblesville, 17.0; Greencastle, 16.2; Romney, 16.0; Spiceland, 15.0; Farmland, 14.5; Richmond and Angola, 14.0; Connersville, 12.5; Mauzy, 12.2; Dana, 12.0; Indianapolis, 11.9; Frankfort, 11.0; Greenfield, 10.0; Terre Haute, 9.0; Bloomington, 6.7; Columbus, 5.5; Laconia, 5.0; Sunman, 4.5; Huntingburg, 3.7; Salem, 3.2; Vevay, 3.0.
Iowa.—West Union, 16.4; Keokuk and Indianola, 14.6; Cedar Rapids, 14.4; Muscatine, 12.7; Independence, 12.4; Ottumwa, 12.3; Logan, 12.0; Dubuque, 11.2; Des Moines and Madison, 10.0; Monticello, 9.2; Round Grove, 9.0; Oskaloosa, 6.5; Davenport, 6.2.
Kansas.—Salina, 18.0; Fort Scott, 10.0; Sherlock and Clay Centre, 8.8; Allison, 7.5; Lawrence, 6.5; Yates Centre, 6.4; Wyandotte, 6.2; Independence, 5.5; Dodge City, 5.4; Elk Falls and Topeka, 5.0; Maud, 4.5; Wellington and Holton, 4.2; Leavenworth, 3.8; Atchison, 3.5.
Maine.—Gardiner, 18.5; Orono, 16.0; Portland, 10.4; Eastport, 7.5.
Maryland.—Cumberland, 9.0; Fallston, 6.0; Baltimore, 3.8.
Massachusetts.—Williamstown, 21.0; Rowe, 19.0; Fall River, 18.0; Springfield, 16.8; Kingston, 16.5; Worcester, 15.0; Westborough, 13.5; Leominster, 12.0; Cambridge, 11.6; Amherst, 11.5; Somerset, 11.4; Princeton, 9.9; New Bedford, 9.0; Milton, 8.0; Taunton, 7.8; Chestnut Hill, 7.5; Mendon, 6.0.
Michigan.—Marquette, 67.3; Kalamazoo, 37.0; Mackinaw City, 35.0(?); Boyne, 33.5; Mottville, 29.0; Alpena, 26.3; Traverse City, 24.5; Ionia, 23.8; Hudson, 19.8; Manistique, 19.2; Lansing, 18.7; Hillsdale, 17.4; Moorestown, 16.4; Thornville, 16.0; Escanaba, 14.7; Grand Haven, 13.6; Port Huron, 9.8; Detroit, 8.6.
Minnesota.—Minneapolis, 24.6; Chester, 23.0; Northfield, 20.8; Duluth, 17.0; Saint Paul, 14.9; Saint Vincent, 11.7; Moorhead, 8.0.
Montana.—Fort Custer, 35.3; Fort Shaw, 24.7; Helena, 15.6; Fort Benton, 13.7; Fort Maginnis, 8.2; Fort Assinaboine, 7.1.
Missouri.—Saint Louis, 9.6; Conception, 5.0.
Nebraska.—Madison, 18.0; Genoa, 16.5; Fremont, 14.6; De Soto, 12.1; Red Willow, 10.0; Tecumseh, 8.0; Omaha, 5.9; Stockham, 3.8.
Nevada.—Otego, 29.0; Toano, 19.0; Winnemucca, 17.0; Wells, 13.5; Halleck, 7.8; Palisade and Elko, 6.0; Hawthorn, Wadsworth, and Hot Springs, 4.0; Beowawe, 3.0.
New Hampshire.—Grafton, 18.5; Concord, 18.0; Hanover, 17.0; Contoocook and Antrim, 16.0; Manchester, 13.5; Mount Washington, 7.7.
New Jersey.—Paterson, 11.2; Somerville, 10.2; South Orange, 9.5; Vineland, 6.2; Cape May, 4.2.
New Mexico.—Santa Fé, 18.6; Lordsburg, 3.0.
New York.—Rochester, 27.1; Humphrey, 22.0; Port Jervis,

20.0; Menand Station (near Albany), 16.6; Auburn 16.4; Buffalo, 15.8; Mountainville, 14.0; Factoryville, 13.5; Cooperstown and Palermo, 12.0; Oswego, 10.6; Penn Yan, 10.5; White Plains, 10.0; Le Roy, 9.6; New York City, 9.4.

North Carolina.—Asheville, 5.5.

Ohio.—Sandusky, 33.0; North Lewisburg, 24.5; Garrettsville, 21.8; Wauseon, 18.5; Margaretta and Ruggles, 18.0; Cleveland, 15.5; Hiram and New Athens, 14.0; Toledo, 10.5; Westerville, 9.4; Jacksonburg, 7.0; Cincinnati, 6.6; College Hill, 6.0; Columbus, 5.1; Portsmouth, 3.8.

Oregon.—Eola, 60.8; Albany, 36.0; East Portland, 28.0.

Pennsylvania.—Eola, 15.0; Tamaqua, 14.6; Troy, 14.2; Blooming Grove, 13.0; Drifton, Leetsdale and Grampian Hills, 12.5; Catawissa, 9.3; Wellsboro, 9.0; Pittsburg, 8.4; Chambersburg, 8.0; Fallsington, 7.4; Westchester, 7.2; Philadelphia, 4.6; Germantown, 4.5; Howard College, 3.2.

Rhode Island.—Providence, 16; Nyatt Point, 11.8; Pawtucket, 9.4; Point Judith, 7.1.

Texas.—Fort Elliott, 6.3.

Utah.—Nephi, 19.7; Promontory, 14.0; Kelton, 12.0; Terrace, 11.6; Salt Lake City, 11.0; Ogden, 7.5; Blue Creek, 6.5.

Vermont.—Woodstock, 23.2; Strafford, 23.0; Charlotte, 22.0; Newport, 21.2; Lunenburg, 21.0; Dorset, 19.5; Burlington, 17.0.

Virginia.—Accotink, 5.0; Lynchburg, 3.4; Dale Enterprise, 3.0.

Washington Territory.—Dayton, 54.0; Spokane Falls, 30.2; Port Angeles, 22.9.

West Virginia.—Helvetia, 8.2.

Wisconsin.—Embarras, 29.0; Manitowoc, 25.0; Franklin, 23.0; Wausau, 19.0; La Crosse, 18.5; Prairie du Chien, 15.8; Neillsville, 14.0; Lancaster, 13.4; Beloit, 13.2; Sussex, 12.8; Madison, 12.2.

Wyoming.—Fort Bridger, 25.4; Cheyenne, 5.0.

DEPTH OF UNMELTED SNOW ON GROUND AT END OF THE MONTH.

[*Expressed in inches and tenths.*]

Arizona.—Fort Grant, 1.5.

California.—Fort Bidwell, 3.5.

Colorado.—Pike's Peak, 10.0; West Las Animas, 5.0; Pueblo, 2.0; Denver, 1.0.

Connecticut.—Hartford, trace.

Dakota.—Fort Sully, 12.0; Yankton, 7.0; Fort Bennett, 6.1; Fort Totten, 6.0; Deadwood, 5.5; Fort Buford, 4.5; Huron and Richardton, 4.0; Webster, 3.0.

Idaho.—Boisé City, 15.2; Lewiston, 10.3.

Illinois.—Riley, 0.2; Chicago and Bunkerhill, trace.

Indiana.—Indianapolis and Greencastle, 0.2; Spiceland, trace.

Iowa.—West Union, 6.0; Des Moines and Indianola, 5.0; Ottumwa, 4.0; Independence, 3.5; Oskaloosa, 3.0; Monticello and Muscatine, 2.0; Dubuque, 1.0; Round Grove, 0.5.

Kansas.—Salina, 9.0; Allison, 6.5; Sherlock, 6.0; Dodge City, 4.0; Maud, 3.0; Topeka, Wellington and Wyandotte, 2.0; Yates Centre, Elk Falls and Atchison, 0.5.

Maine.—Gardiner, 7.0; Eastport, trace.

Maryland.—Cumberland, 2.0.

Michigan.—Marquette, 50.0; Northport and Traverse City, 10.0; Manistique, 9.0; Escanaba, 4.5; Boyne, 3.0; Grand Haven, 0.5; Alpena, 0.2; Hillsdale, 0.1; Ionia, trace.

Minnesota.—Northfield, 15.0; Saint Paul, 13.0; Saint Vincent and Duluth, 10.0; Moorhead, 3.0.

Montana.—Helena, 14.5; Fort Shaw and Fort Custer, 10.0; Fort Maginnis, 7.8; Fort Assinaboine, 6.05; Fort Benton, 5.0.

Missouri.—Conception, 3.0; Saint Louis and Pierce City, trace.

Nebraska.—Genoa, 10.0; Fremont and Red Willow, 8.0; De Soto, 6.2: Madison and Tecumseh, 6.0; Omaha, 4.5; North Platte, 2.5; Stockham, 1.5.

Nevada.—Winnemucca, 1.0.

New Hampshire.—Mount Washington, 1.0.

New Mexico.—Santa Fé, 18.0 on mountains and 5.0 in valleys.

New York.—Oswego, in drifts; Auburn, 2.0; Albany, Rochester, Le Roy, North Volney, Palermo, Ithaca, Mountainville and Humphrey, trace.

Ohio.—Toledo, trace.

Oregon.—Albany and Eola, 18.0

Pennsylvania.—Wellsboro, 2.0; Chambersburg, 1.0; Catawissa, trace.

Rhode Island.—Providence, 1.0.

Utah.—Salt Lake City, trace.

Vermont.—Woodstock, 6.0; Strafford, 1.0; Dorset, trace.

Washington Territory.—Spokane Falls, 28.0; Dayton, 26.0.

Wisconsin.—Embarras, 16.8; Wausau, 13.0; Neillsville, 9.0; Manitowoc and La Crosse, 6.0; Lancaster, 4.0; Madison, 2.0.

Wyoming.—Cheyenne, 0.5.

SLEET.

Sleet fell during the month as follows:

Arizona.—Willcox, 29th.

Arkansas.—Fort Smith, 26th, 27th; Lead Hill, during night of 26-27th.

California.—San Francisco, 30th.

Connecticut.—Bethel and New Haven, 21st; New London, 28th.

District of Columbia.—Washington City, 19th, 20th, 21st.

Georgia.—Milledgeville, 20th; Atlanta, 21st.

Idaho.—Boisé City, 4th, 20th, 25th.

Illinois.—Sandwich, 27th; Springfield, 20th, 27th, 30th.

Indiana.—Vevay, 21st; Lafayette, 27th; Sunman, 12th, 13th, 21st, 29th; Logansport, 27th; Greencastle, 11th, 12th, 21st, 22d; Indianapolis, 11th, 14th, 16th.

Iowa.—Humboldt, 5th, 26th; Ottumwa, 2d, 27th, 29th, 30th; Des Moines, 30th.

Kansas.—Salina, 11th, 29th, 30th; West Leavenworth, 29th; Independence, 30th; Holton, 9th, 26th, 29th; Leavenworth, 21st, 26th, 27th.

Louisiana.—Liberty Hill, 26th.

Maine.—Portland, 23d; Eastport, 15th.

Maryland.—Fort McHenry, 29th; Emmitsburg, 14th, 20th; Baltimore, 14th, 21st, 22d; Fallston, 14th.

Michigan.—Grand Haven, 27th; 31st; Escanaba, 7th, 29th, 30th, 31st.

New Hampshire.—Mount Washington, 6th, 7th.

New York.—Forts Columbus and Hamilton, 14th; West Point, 22d; Albany, 21st, 22d; Rochester, 13th, 15th; New York City, 12th; Oswego, 11th, 14th.

North Carolina.—Lenoir, 21st; Weldon, 24th; Statesville, 18th, 20th 21st, 22d, 23d; Charlotte, 21st, 28th; New River Inlet, 26th; Fort Macon, 18th, 19th; Wilmington, 18th, 20th.

Ohio.—Wauseon, 14th, 15th, 22d, 27th; Columbus, 12th, 20th; Toledo, 14th.

Pennsylvania.—Leetsdale and Pittsburg, 10th.

Rhode Island.—Narragansett Pier, 12th.

Tennessee.—Milan, 17th; Nashville, 17th, 27th; Chattanooga, 20th, 21st; Knoxville, 18th.

Texas.—Clarksville, 26th; Palestine, 25th; El Paso, 29th, 30th.

Utah.—Salt Lake City, 3d.

Virginia.—Norfolk, 18th; Wytheville, 21st; Lynchburg, 21st, 24th; Fort Myer, 14th, 21st, 27th.

Washington Territory.—Dayton, 19th, 26th; Fort Canby, 31st.

Wisconsin.—Beloit and Embarras, 27th; Prairie du Chien, 26th, 27th; Milwaukee, 12th, 27th.

Wyoming.—Cheyenne, 23d.

HAIL.

Arizona.—Wickenburg, 8th, 9th, 12th; Fort Grant, 9th; Tucson, 8th, 28th.

Arkansas.—Mount Ida, 26th.

California.—Fall Brook, 7th; Poway, 12th.

Table of excessive and greatest monthly precipitation—December, 1884.

Station.	Specially heavy. Date.	Amt.	Largest monthly. Amount.
Alabama.			
Prattville	14	3.50	8.39
Tuscumbia	21	2.54	7.03
Clanton	14	2.79	7.00
Carrollton	14	3.10	7.05
Gadsden	14	2.00	6.91
Do	21	2.25	
Florence	21	2.32	6.53
Mount View	20, 21	3.60	6.45
Greensboro			6.09
Greene Springs	14	2.06	
Wetumpka	14	2.50	
Tuscaloosa	14	3.40	
Marion	14	2.00	
Edwardsville	21	2.00	
Arizona.			
Fort Bowie	13	2.30	6.41
Phœnix	12, 13	2.50	
San Carlos	27, 28	2.04	
Arkansas.			
Little Rock	27 to 30	11.23	16.92
Mount Ida	10, 11	3.75	15.95
Do	26 to 30	10.35	
Lead Hill	10, 11	2.08	11.37
Do	26, 27, 28	5.82	
Fort Smith	27, 28	2.69	6.30
California.			
Emigrant Gap			31.20
Colfax			23.60
San Raphael, near	17 to 21	11.45	20.96
Do	23 to 26	7.69	
Cisco			25.00
Auburn			16.37
Calistoga			15.08
Delta			16.41
Redding			14.51
Fort Gaston	15, 16, 17	4.61	14.49
Do	21, 22, 23	4.08	
Alta			14.08
Aptas			11.34
Truckee			13.24
Sacramento	17 to 26	10.30	10.45
Napa			10.16
Santa Cruz			8.91
Gilroy			8.83
Ione			8.22
Tennant			8.11
Petaluma			8.07
Angel Island			7.85
Rocklin			7.75
Oakland			7.73
Red Bluff	16, 17, 18	3.76	7.73
San Francisco	19, 20	2.25	7.68
Do	23, 24	2.53	
San Mateo			7.59
Suisun			7.46
Pajaro			7.45
Boca			8.20
Benicia Barracks	24, 25, 26	4.54	7.19
Dunningan			7.16
Fall Brook	12, 13	2.21	7.15
Fort Bidwell			6.81
Farmington			6.21
Brighton			6.17
Galt			6.06
Princeton	16, 17	2.48	6.03
South Valejo			6.03
Los Angeles	25	3.01	
Poway	25	2.07	
Presidio of San Francisco	23	2.00	
Connecticut.			
Voluntown	6, 7	2.90	8.00
Do	15	2.00	
Do	21, 22	2.20	
Wallingford			7.52
Shelton			7.37
New London	6, 7	2.27	7.30
Middleton			7.20
Bethel	21, 23	2.00	6.52
Southington			6.45
New Haven	21, 22	2.21	6.41
Hartford			6.09
Norfolk			6.02
Florida.			
Newport	5	3.80	10.99
Do	12, 13, 14	3.98	
Do	21, 22	2.08	
Cedar Keys	5, 6	5.16	
Georgia.			
Quitman	6	3.70	6.60
Atlanta	14	3.74	6.09
Athens	14, 15	2.95	
Augusta	21, 22	2.16	
Idaho.			
Albion	14	2.00	7.34
Boisé City	16, 17	2.32	
Illinois.			
Anna	28, 29, 30	6.30	9.57
Cairo	11	2.46	8.99
Do	27 to 30	4.94	
McLeansboro'			8.24
Collinsville	27, 28	3.02	7.62
Mascoutah			6.90
Rockford			6.51
Illinois—Cont'd.			
Springfield	27, 28	2.79	
Bunker Hill	27, 28	3.08	
Logansport	27, 28, 29	3.81	
Indiana.			
Princeton			7.70
Marengo			7.55
Worthington			7.20
Fillmore			7.04
Corydon			6.85
Farmland			6.79
Greencastle			6.74
Huntingburg			6.66
Degonia Springs			6.52
Spiceland	27	2.71	6.47
Lafayette			6.27
Maurzy			6.14
Indianapolis	27, 28	2.39	6.05
Columbus			6.01
Terre Haute	27	2.25	
Louisiana.			
Point Pleasant	5	3.01	20.39
Do	14	5.01	
Do	20, 21	4.03	
Do	28, 29, 30	8.03	
Shreveport	10, 11	3.55	15.55
Do	27 to 30	13.41	
Grand Coteau	10	3.25	14.43
Do	16, 17	2.45	
Do	27 to 30	4.67	
New Orleans	13, 14	2.49	8.01
Luling			6.13
Maine.			
Eastport	7	2.38	8.63
Do	21, 22	3.74	
Portland	13	2.30	6.42
Orono	20, 21	2.20	
Maryland.			
Fallston	6	2.80	6.06
Ocean City			6.04
Massachusetts.			
Princeton	6, 7	4.83	9.59
Do	21, 22	3.75	
Milford			7.70
Fall River	6, 7	2.00	6.94
Northampton			6.51
Rowe	6	2.00	
New Bedford	21, 22	2.00	
Michigan.			
Marquette	6, 7	2.59	8.65
Kalamazoo			7.14
Grand Haven	29, 30	2.42	6.80
Boyne			6.52
Mackinaw City			6.48
Mississippi.			
Vicksburg	28 to 31	9.25	14.09
Missouri.			
Pro Tem			11.37
Pierce City	5	2.00	10.10
Do	10, 11	3.00	
Springfield	28, 29	2.40	7.62
Ironton			7.47
Centreville			7.22
Carthage			6.91
Saint Louis	27, 28	3.09	6.18
New Jersey.			
Atlantic City	21, 22	3.14	7.71
Barnegat City	21, 22	3.02	7.09
Readington			7.00
Cape May	21, 22	3.19	6.87
Vineland			6.53
Paterson	6, 7	2.35	
Little Egg Harb'r	21, 22	2.01	
New York.			
David's Island	6	2.25	8.75
Do	21, 22	3.25	
New York City	21	2.10	6.66
Fort Columbus	21, 22	2.28	6.44
West Point			6.20
Port Jervis	6	2.32	
White Plains	6	2.40	
Fort Hamilton	14	2.10	
North Carolina.			
Brevard	5, 6	2.85	10.25
Do	14, 15	2.78	
Do	20, 21	2.75	
Kelley's, near Raleigh			9.40
Lincolnton			9.32
Lenoir	5, 6	2.60	8.10
Do	14	2.00	
Hatteras	21, 22	2.73	7.41
Chapel Hill	5, 6	3.01	6.98
Weldon	5, 6	2.68	
Charlotte	21, 22	2.12	
Oregon.			
Roseburg	16, 17	3.35	9.20
Fort Klamath	22, 23, 24	3.66	8.68
Albany	17, 18	3.84	7.83
Portland			7.52
Astoria			6.55
Eola			6.09
Pennsylvania.			
Tamaqua	6	2.30	7.40
Westchester	6, 7	2.62	7.00
Pennsylvania—C'd.			
Quakertown			6.46
Wellsborough	6, 7	4.66	6.39
Easton			6.07
Fallsington			6.00
Lafayette	6	2.00	
Blooming Grove		2.90	
Rhode Island.			
Pawtucket			7.07
Nyatt Point	6, 7	2.10	7.03
Providence			6.59
Block Island			6.56
Narragansett Pier			6.34
South Carolina.			
Aiken	6, 7	2.04	6.02
Do	22, 23	2.25	
Pacolett			6.00
Statesburg	6, 7	3.65	
Tennessee.			
Memphis	28, 29, 30	5.35	9.14
Dyersburg	27, 28, 29	5.01	8.85
Somerville	29, 30	2.39	7.91
Milan	27, 28	2.63	7.25
Fostoria	14	2.00	7.20
Do	21	2.85	
Trenton	28, 29, 30	3.62	7.14
Flat Creek	21	2.62	7.04
Chattanooga	21, 22	2.91	6.80
Tennessee—Cont'd.			
Farmingdale	21	2.25	6.73
Parkersville	21	2.72	6.51
Grief	21	2.70	6.49
Carysville	14	2.00	6.21
Do	21	2.10	
Howell	21	2.46	6.19
Knoxville	20, 21	2.37	6.11
Maryville	21, 22	3.05	6.00
Pulaski	21	2.10	
Covington	28, 29	2.84	
Grassy Cove	21	2.06	
McMinnville	21	2.10	
Texas.			
Galveston	27, 28	6.71	9.44
Clarksville	28, 29, 30	4.00	7.48
Palestine	10, 11	3.77	6.94
Fort Concho	9, 10	2.90	
Utah.			
Nephi	21, 22	2.40	
Virginia.			
Lynchburg	21	6.74	11.81
Dale Enterprise	6	2.00	
Washington Ter.			
Olympia	18, 19	3.67	
Wisconsin.			
Franklin	29, 30	2.25	

Connecticut.—Hartford, 21st.

Delaware.—Delaware Breakwater, 10th, 24th.

District of Columbia.—Washington City, 14th.

Illinois.—La Fayette, 27th.

Iowa.—Guttenberg, 1st; Independence and Monticello, 27th; Ottumwa, 30th.

Kansas.—Wyandotte, 9th, 30th; Yates Centre, 30th.

Louisiana.—Liberty Hill, 26th.

Maine.—Gardiner, 21st.

Maryland.—Woodstock, 14th, 20th.

Massachusetts.—Westborough, 22d.

Michigan.—Fort Brady, 31st; Boyne, 27th.

New York.—Fort Columbus, 9th, 14th; Factoryville, 21st.

North Carolina.—Weldon, 18th, 21st.

Pennsylvania.—Dyberry, 14th; Easton, 15th.

South Carolina.—Stateburg, 22d.

Texas.—Fort Concho, 30th; Clarksville, 4th.

Virginia.—Fort Myer, 14th; Wytheville, 6th; Dale Enterprise, 21st.

Washington Territory.—Port Angeles, 5th; Pysht, 25th.

Wisconsin.—Embarras, 9th, 23d, 27th, 30th, 31st; Manitowoc, 27th.

SNOW FROM A CLOUDLESS SKY.

Toledo, Ohio: snow fell from a cloudless sky from 10.35 to 10.55 p. m. on the 26th.

WINDS.

The most frequent directions of the wind during December, 1884, are shown on chart ii. by arrows flying with the wind; they were from north to northwest in the upper Mississippi and Missouri valleys, and extreme northwest; from south to west in the lake region; from northeast to northwest on the Atlantic coast; from east to south in the Gulf states; in the remaining districts they were variable.

HIGH WINDS.

(In miles per hour.)

High winds occurred during the month as follows:

Sandy Hook, New Jersey, 60 n., 19th.

Barnegat City, New Jersey, 56, s., 6th.

Cape May, New Jersey, 60, w., 9th.

Delaware Breakwater, Delaware, 51, nw., 9th.

Cape Henry, Virginia, 54, nw., 9th.

Kitty Hawk, North Carolina, 60, n., 18th.

Buffalo, New York, 64, sw., 15th.

Rochester, New York, 54, w., 15th.

Fort Elliott, Texas, 60, n., 4th.

Tatoosh Island, Washington Territory, 64, e., 16th.

Cape Mendocino, California, 108, se., 16th.

On the summits of Mount Washington, New Hampshire and Pike's Peak, Colorado, velocities of fifty miles or more were reported on the following dates:

Mount Washington, 2d, 6th to 10th, 14th to 17th, 19th, 20th, 21st, 23d, 27th, to 31st. The maximum velocity, 96, nw., occurred on the 19th.

Pike's Peak, 8th, 15th, 16th, 24th; (maximum velocity, 73, w., on the 15th).

LOCAL STORMS AND TORNADOES.

Alabama.—Mobile: during the afternoon of the 18th the bark "Nannie Bell" dragged anchor and was driven on a sand-bar on the opposite side of the river; no damage resulted.

California.—Red Bluff: the Signal Service observer reports northerly gales on the 6th, which continued during the night. At Red Bluff the velocity of the wind did not exceed thirty-eight miles per hour, but a much higher velocity was attained in the eastern part of the county. At the Champion lumber mills, thirty miles north of this place, a large number of trees, varying in size from six inches to four feet in diameter, were blown down. This storm is considered to have been one of the severest ever experienced in this part of the state.

San Francisco: a violent storm prevailed at this place on the 7th, the wind reaching a velocity of forty-five miles per hour between 6 and 7 a. m. The greatest damage was done along the water front; the breakwater at the foot of Green street was completely washed away, and two sections of the sea wall were crushed in. Several vessels in the harbor broke from their moorings and were blown ashore, while many others sustained damage.

Colorado.—Colorado Springs: an unusually severe storm prevailed during the night of the 18–19th; trees and telegraph lines were prostrated.

Louisiana.—New Orleans, 28th: a southeasterly gale began at 11.10 a. m. and ended at 2.20 p. m., the wind reaching a velocity of twenty-eight miles per hour at 1.30 p. m.; at 11.50 p. m. the wind again reached a velocity of twenty-five miles per hour, and continued high until 2.25 a. m. on the 29th.

Shreveport: a heavy rain and thunder-storm from the southeast occurred during the night of the 29–30th, the wind attaining a velocity of twenty-six miles per hour from 4.45 to 5.00 a. m. Reports from the surrounding country state that telegraph lines were prostrated, and that the heavy rains caused the streams to rise rapidly; washouts occurred on the railroads.

New Jersey.—Trenton: several buildings at this place were badly damaged and many telephone wires were broken down by the storm of the night of the 6–7th.

New York.—New York City: a severe snow and rain squall occurred on the afternoon of the 9th, the wind reaching a velocity of forty miles per hour at 2.57 p. m.

Ohio.—Columbus: a high northwesterly wind began at 8.21 a. m.; a wind velocity of thirty miles per hour occurred at 9.15 a. m.

Pennsylvania.—Pittsburg: a high westerly wind prevailed for a short time between 1 and 2 p. m. on the 9th; a velocity of thirty-six miles per hour was recorded.

Erie: high southwest to northwest winds prevailed from 9.15 a. m. to 3.13 p. m. on the 9th; a velocity of thirty-five miles per hour from the northwest occurred at 12.14 p. m.

Chester: at 9 p. m. on the 6th a violent storm passed over this place, moving from southwest to northeast; about twenty houses in this city were unroofed and much other damage was done.

Easton: a storm of unusual violence occurred during the evening of the 6th, being most violent at about 10 p. m.; the rainfall was very heavy, and caused streams in this vicinity to rise rapidly.

Virginia.—Fort Myer: high wind prevailed from 1.30 to 6.15 p. m. on the 9th, reaching its height at 2.55, when a velocity of forty-two miles per hour was recorded. A wind velocity of thirty-eight miles occurred on the 23d.

Cape Henry: at 3.43 p. m. on the 9th the wind suddenly shifted from southwest to northwest and increased in force from sixteen to fifty-four miles per hour.

Reports from the vicinity of Urbana, Middlesex county, on the Rappahannock river, state that a violent storm occurred on the 9th, during which about twenty-five oyster boats were capsized and nearly all the boatmen were drowned.

Washington Territory.—Fort Canby: the Signal Service observer reports that a southeasterly gale occurred during the night of the 2–3d. During the following day the sea was unusually rough and the tides very high. The steamship "Willamette," in attempting to enter the harbor, sustained damage; a heavy sea swept over the vessel washing two men overboard and clearing the decks of everything. On the 16th a high wind began at 6.30 p. m., and between 7 and 8 p. m. the wind blew at the rate of one hundred and four miles per hour. Considering the violence of this storm but little damage was done. Violent gales also prevailed at Fort Canby during the 23d and 24th. During the night of the 23–24th, the ship "Cheseborough," lying at Sand Island, dragged anchor for a distance of two miles against a strong flood tide, and grounded on the extreme northeast end of Clatsop Spit, about four miles from station.

Port Angeles: from 5 to 5.35 p. m. on the 5th, a violent hailstorm, accompanied by thunder and lightning, passed over this station. The hail stones were very small but fell with great force and in sufficient quantity to cover the ground to a depth of about three fourths of an inch.

The following reports of tornadoes which occurred during December have been received:

Plum Branch, Edgefield county, South Carolina: a tornado occurred in the southwestern part of Clarendon county, in this state, on the 22d. The tornado cloud was funnel-shaped and moved northeastward, destroying everything in its path, which was about fifteen miles in length and 1,500 feet in width. Several persons were injured; a number of horses and cattle were killed, and several buildings were destroyed.

Atlanta, Georgia: a tornado occurred in Oconee and Oglethorpe counties at 2.00 p. m. on the 22d. The width of the tornado's path was two hundred and twenty-five feet. Several buildings and much timber were destroyed.

On the evening of the 24th a tornado passed through Berrien county; the cloud was of the usual funnel-shape, and it descended to the earth but for a moment, but in that time it destroyed all the buildings on plantations and scattered the farm produce.

Pine Ridge, Twiggs county, Georgia: a tornado occurred six miles southwest of Macon, in this state, at 11 a. m. on the 22d. It is described as "swooping down for a distance of three hundred yards and then ascending." Only one plantation was struck by the tornado, but all the buildings thereon were destroyed; no loss of life occurred.

NAVIGATION.

STAGE OF WATER IN RIVERS.

At Shreveport, Louisiana, the Red river reached a navigable stage, six feet and six inches on the 16th; on the 29th a sudden and unusual rise occurred, the river having risen five feet and three inches in twenty-four hours.

Navigation on the Cumberland river at Nashville, Tennessee, was resumed for the season on the 16th. Steamboat men at this place state that the date of the opening of navigation for the present season is one of the latest known.

The Mississippi river was frozen throughout the month at Saint Paul, Minnesota; at La Crosse, Wisconsin, it froze on the 17th; at Dubuque and Davenport on the 18th, and at Keokuk on the 21st; at these stations it remained frozen after the dates named.

The Missouri river froze at Yankton, Dakota, on the 15th;

at Omaha, Nebraska, on the 17th; and at Leavenworth, Kansas, on the 18th.

The Arkansas river, at Little Rock, when at its highest stage on the 31st, was one inch above the danger line.

In the following table are shown the danger points in the rivers at the various stations, the highest and lowest depths for December, 1884, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, December, 1884.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:	Ft. In.		Ft. In.		Ft. In.	Ft. In.
Shreveport, Louisiana	29 9	31	20 9	1	4 2	16 7
Arkansas:						
Little Rock, Arkansas	23 0	31	23 1	7, 8	5 3	17 10
Fort Smith, Arkansas	15 0	31	10 7	27	‡— 3 5	14 0
Missouri:						
Yankton, Dakota*	24 0	1 to 4	6 0	13, 14	5 9	0 3
Omaha, Nebraska*	18 0	8	5 11	16	4 0	1 11
Leavenworth, Kansas*	20 0	8, 9, 10	6 6	15	4 8	1 10
Mississippi:						
Saint Paul, Minnesota ‡	14 6					
La Crosse, Wisconsin*	24 0	8, 9	5 9	16	3 10	1 11
Dubuque, Iowa*	16 0	13, 14	5 8	1	3 6	2 2
Davenport, Iowa*	15 0	15	4 10	3	1 11	2 11
Keokuk, Iowa*	14 0	31	10 6	4	2 4	8 2
Saint Louis, Missouri	32 0	31	16 6	20	3 9	12 9
Cairo, Illinois	40 0	31	24 4	9, 10	7 4	17 0
Memphis, Tennessee	34 0	31	13 5	11, 12	4 1	9 4
Vicksburg, Mississippi	41 0	11	15 11	15	4 10	11 1
New Orleans, Louisiana†	—3 0	31	—10 7	3	—14 0	3 5
Ohio:						
Pittsburg, Pennsylvania	22 0	23	12 11	5	2 1	10 10
Cincinnati, Ohio	50 0	28	20 11	1	4 5	16 6
Louisville, Kentucky	25 0	30	9 5	1, 2, 3	3 3	6 2
Cumberland:						
Nashville, Tennessee	40 0	26	14 10	1	0 8	14 2
Tennessee:						
Chattanooga, Tennessee	33 0	23	12 7	5, 6, 7	1 1	11 6
Knoxville, Tennessee		24	4 5	5	0 4	4 1
Monongahela:						
Pittsburg, Pennsylvania	29 0	23	12 11	5	2 1	10 10
Savannah:						
Augusta, Georgia	32 0	16	20 6	4, 5	5 3	15 3
Willamette:						
Portland, Oregon		22	9 0	13, 14, 15	1 2	7 10
Sacramento:						
Red Bluff, California		26	16 3	5 to 17	0 10	15 5
Sacramento, California		27	24 7	8 to 17	7 6	17 1
Mobile:						
Mobile, Alabama		5	17 2	19	13 0	4 2
Colorado:						
Yuma, Arizona		30	15 9	2	13 5	2 4

‡ Below bench mark. † Below high-water mark of 1874 and 1883.
* Observations interrupted by ice. ‡ Frozen throughout month.

ICE IN RIVERS AND HARBORS.

Saint Croix river.—Calais, Maine: the river closed to navigation on the 20th.

Kennebec river.—Gardiner, Kennebec county, Maine: river closed on the 14th, having been open 250 days.

Penobscot river.—Bangor, Maine: "anchor ice" along the shores on the 2d; on the 7th the ice was broken up and carried out by the tides; during the night of 18–19th the river froze over.

Connecticut river and New Haven harbor.—New Haven, Connecticut: the harbor was partially frozen on the 20th; the river froze over on the same date.

Hudson river.—Menand Station, (near Albany) New York: navigation closed for the season on the 19th; ice started in the river on the 31st.

Albany, New York: floating ice, 15th to 18th; river frozen over on the 19th; navigation on the canals was closed on the 1st.

Troy, New York; pedestrians crossed the river on the ice on the 20th.

Rondout, New York: the cold weather during the night of the 19–20th closed the river at this point, ice five inches thick having formed. The ferry-boats plying between this place and Rhinebeck continued to make trips with difficulty.

Poughkeepsie, New York: river filled with floating ice on the 25th.

Chincoteague bay.—Chincoteague, Virginia: the bay froze over on the 19th.

Little Egg harbor.—Little Egg harbor, New Jersey: much ice in the sound and bay on the 20th.

Potomac river.—Washington, District of Columbia: the river was partly frozen on the 19th; the ice in the channel was kept broken by steamers.

Fort Myer, Virginia: river froze over on the 19th.

Henderson bay.—Madison Barracks, New York: bay froze over on the 19th; ice broke up during the night of the 22d; bay froze over again on the 24th; ice broke up during the night of the 31st.

Oswego river.—Oswego, New York: river froze over on the 30th. The steam barge "Saxon" left port on the 13th, being the last departure of the season.

Niagara river.—Buffalo, New York: the river was frozen from the 19th to 29th; the ice broke up on the latter date.

Lake Erie.—Cleveland, Ohio: the lake was frozen at this place on the 23d.

Erie, Pennsylvania: the propeller "Delaware," which arrived on the 1st, was the last boat of the season to enter this port.

Buffalo, New York: navigation closed for the season on the 6th.

Cuyahoga river.—Cleveland, Ohio: the river froze over on the 1st.

Sandusky bay—Sandusky, Ohio: the first ice in the bay was observed on the 1st; on the 16th, the bay froze over.

Susquehanna river.—Port Deposit, Maryland, 19th: the recent cold weather has filled the river with ice; on the afternoon of this date, ice became stationary, and the river was packed from shore to shore. Several boats are ice-bound at this point.

Maumee river.—Toledo, Ohio: the river was covered with thin ice on the 1st; navigation was closed for the season on the 15th; on the 20th, the ice was four inches thick; the ice began to break up on the 30th.

Thunder bay and Thunder bay river.—Alpena, Michigan: ice in river and bay on the 13th; both bay and river partly frozen on the 15th, and entirely frozen on the 17th.

Straits of Mackinac.—Mackinaw City, Michigan: during the night of the 16–17th, the strait froze to a distance of five hundred yards from the shore.

Little Bay De Noquet.—Escanaba, Michigan: the tug "A. Booth," left for Chicago on the 9th, being the last departure of the season; the bay was partly frozen on the 13th, and entirely frozen on the 14th.

Lake Michigan.—Milwaukee, Wisconsin: the propeller "Rochester" arrived on the 9th, being the last boat of the season; ice formed along the shores of the lake on the 13th.

Chicago, Illinois: lake frozen on the 17th.

Duluth bay.—Duluth, Minnesota: the propeller "N. K. Fairbanks" arrived on the 1st, being the last boat of the season; the bay was frozen along the docks on the 2d; considerable floating ice on the 4th; ice formed along the shores of the lake on the 16th; the ice began to break up and move out on the 28th; on the 30th, the north side of the lake was clear of ice.

Scioto river.—Columbus, Ohio: the river froze over on the 9th.

Detroit river.—Detroit, Michigan: floating ice on the 1st and 19th; river was nearly free of ice on 28th and 29th.

Rock river.—Rockford, Winnebago county, Illinois: river clear of ice on the 7th; light ice floating on 10th; river closed again on 13th.

Grand river.—Grand Haven, Michigan: first ice in river on 16th; river frozen on 18th.

Lansing, Michigan: on the 15th, for the second time this season, the river froze over; ice broke up again on the 31st.

Saint Joseph river.—Mottville, Michigan: the rains from the 27th to 30th broke up the ice in the river at this place.

Saint Clair river.—Port Huron, Michigan: heavy floating ice on the 25th.

Black river.—Port Huron, Michigan: river froze over on the 18th.

Des Moines river.—Des Moines, Iowa: river froze during the night of the 15–16th.

Maquoketa river.—Monticello, Jones county, Iowa; ice went out of the river on the 5th, river closed again on the 14th, on the 20th the ice was fourteen inches thick.

Arkansas river.—West Las Animas, Colorado: the river froze over on the 24th.

Fort Smith, Arkansas: ice formed in the river on the 18th; floating ice observed on 19th, 20th, 24th, 25th, 28th, 29th.

Ohio river.—Pittsburg, Pennsylvania: floating ice on the 4th, 5th, and from the 18th to 31st.

Leetsdale, Allegheny county, Pennsylvania: floating ice in river nearly the entire month.

Portsmouth, Scioto county, Ohio: river full of floating ice from 21st to 31st.

Cincinnati, Ohio: floating from 23d to 31st; navigation suspended from 25th to 29th; river clear of ice on 31st.

Louisville, Kentucky: floating ice from 19th to 31st; on the 21st navigation was suspended at all points from Pittsburg to Cairo; navigation was resumed on the 29th.

Laconia, Indiana: floating ice on the 23d.

Mississippi river.—Saint Paul, Minnesota: the river remained frozen throughout the month.

La Crosse, Wisconsin: floating ice on 3d; river froze on 17th.

Dubuque, Iowa: floating ice from 1st to 4th, 6th, 7th, 9th to 17th; river frozen from 18th to 31st.

Davenport, Iowa: floating ice on 1st, 2d, 7th to 17th; river closed on 18th; on the 20th pedestrians crossed on the ice, and on the 22d teams crossed. The ferryboats made their last trips on the 15th.

Burlington, Iowa: floating ice on 11th; river closed during the night of 18–19th.

Keokuk, Iowa: floating ice on 1st; on the 5th the river was free of ice, and the steamers "Plough Boy" and "Rescue" made regular trips. Navigation was again suspended on the 12th on account of drift ice; on the 20th an ice-dam formed; the river froze over on the 21st.

Cairo, Illinois: large quantities of floating ice on the 19th, closing navigation to the northward; the heavy drift ice on the 26th caused considerable damage; two boats were sunk, one of which contained 6,000 bushels of coal.

Memphis, Tennessee: ice formed along the shores on the 23d; floating ice from 23d to 27th; on the latter date navigation was suspended on account of ice, which was reported in the Mississippi, as far southward as the mouth of the Arkansas river, two hundred and fifteen miles from Memphis.

Missouri river.—Fort Buford, Dakota, river closed on 14th.

Yankton, Dakota: river froze on the 15th.

Omaha, Nebraska: river froze during the morning of the 17th.

Fort Sully, Dakota: floating ice on 2d, 3d; river clear on 4th; floating ice on 10th and 11th; river closed during night of 16–17th. No boats ran north of Yankton after November 27th.

Fort Bennett, Dakota: river froze on 17th.

Leavenworth, Kansas: ice-dam formed on 16th; river closed on 18th.

Miscellaneous.—Baltimore, Maryland, 27th: ice, in sufficient quantities to interrupt navigation, is reported from the smaller tributaries to the bay.

Delaware Breakwater, Delaware, 19th: ice six inches thick.

Fort Scott, Kansas: at close of the month ice was ten inches thick.

FLOODS.

Arkansas.—Little Rock, 31st: reports from points along the Memphis and Little Rock railroad state that in many places along this road the country is covered with water, and in some instances it reached the level of the road bed. Reports from along the line of the Iron Mountain road stated that similar conditions existed in the country through which that road passes. A train from Arkansas City, due at Little Rock at 8.46 p. m. on the 29th, did not arrive until 7.30 on the following morning, and the passengers reported that in some places the whole country was under water; from Pine Bluff to Arkansas City all of the large plantations were inundated.

California.—Sacramento: the Sacramento river on the 27th, reached a height of 24 feet 7 inches, or within 1 foot 11 inches of high water mark. The American river began to fall on the 26th, after having overflowed many of the hop-fields in the vicinity of Brighton. Reports from Marysville, Yuba county, on the 26th, stated that the water in Feather river had reached the top of some of the levees in Sutler county, about sixteen miles below Marysville.

It is reported from Nevada City, Nevada county, that in that vicinity the Yuba river reached the highest point on the 25th that has been known since 1862.

At Chico, Butte county, the Butte creek levee gave way on the 25th, and a large volume of water poured through the breaks.

At Linden, San Joaquin county, the water was from three to four feet deep in the town, and many small bridges in the vicinity were washed away.

Stockton, San Joaquin county: on the morning of the 25th, the Moss tract of land, west of this place, was flooded, causing a loss of from $40,000 to $50,000.

On the 26th, the mountain streams in Calaveras and Tuolumne counties, were much swollen, endangering the levees and causing suspension of travel.

Merced, Merced county: on the 26th, the low grounds in this vicinity were flooded and the country to the west of this place was under water for miles. The approaches of the bridge over Merced river were endangered.

In the vicinity of Plainsburg, the water reached the highest point known for several years.

Michigan.—Ionia, Ionia county: the Grand river at this place overflowed on the 31st.

HIGH TIDES.

Eastport, Maine, 3d.
New River Inlet, North Carolina, 6th.
Fort Canby, Washington Territory, 3d.

LOW TIDES.

Baltimore, Maryland, 19th.
New River Inlet, North Carolina, 23d, 24th.
Indianola, Texas, 1st, 2d, 7th, 13th, 14th, 18th, 19th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for December, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 79.73 per cent. The percentages for the four elements are: Weather, 85.36; direction of the wind, 76.99; temperature, 74.95; barometer, 86.48 per cent. By geographical districts, they are: For New England, 81.53; middle Atlantic states, 85.23; south Atlantic states, 82.76; eastern Gulf states, 81.41; western Gulf states, 80.63; lower lake region, 75.73; upper lake region, 78.90; Ohio valley and Tennessee, 78.89; upper Mississippi valley, 77.68; Missouri valley, 75.26; north Pacific coast region, 78.23; middle Pacific coast region, 79.84; south Pacific coast region, 76.61. There were three omissions to predict out of 3,066, or 0.10 per cent. Of the 3,063 predictions that have been made, one hundred and seventy-six, or 5.75 per cent., are considered to have entirely failed; one hundred and seventy-four, or 5.68 per cent., were one-fourth verified; three hundred and ninety-four, or 12.86 per cent., were one-half verified; four hundred and sixty-nine, or 15.31 per cent., were three-fourths verified; 1,850, or 60.40 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During December, 1884, one hundred and eighty-six cautionary signals were ordered. Of these, one hundred and

sixty-one, or 86.56 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Sixty-nine off-shore signals were ordered, of which number fifty-nine, or 85.51 per cent., were fully justified, both as to direction and velocity; sixty-three, or 91.30 per cent., were justified as to direction; and sixty, or 87.95 per cent., were justified as to velocity. Two hundred and fifty-five signals of all kinds were ordered, two hundred and twenty, or 86.27 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore signals thirty-six were changed from cautionary. Three signals were ordered late. In one hundred and twenty cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

COLD-WAVE SIGNALS.

There were one hundred and seventy-six cold-wave signals ordered during December, of which number, one hundred and thirty-four, or 76.1 per cent. were justified.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the Alabama weather service, in his December report, makes the following statement:

A careful examination of the meteorological reports from all quarters of the state shows the verification of the weather predictions to be 83 per cent., and of the temperature 90 per cent.

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air at the stations.

Temperature of water for December, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.		Mean temperature of the air at station.
	Max.	Min.				
	°	°	°	ft.	in.	°
Atlantic City, New Jersey	49.6	34.3	14.6	2	7	37.5
Alpena, Michigan*	32.7	29.7	3.0	11	7	23.2
Augusta, Georgia	54.1	40.8	13.3	9	1	50.7
Baltimore, Maryland	48.3	35.1	13.2	9	9	37.4
Block Island, Rhode Island	47.9	30.8	17.1	7	4	37.0
Boston, Massachusetts	38.9	30.4	8.5	21	4	33.1
Buffalo, New York*	38.9	33.4	6.5	10	11	29.8
Canby, Fort, Washington Territory†	49.3	33.6	15.7	17	11	36.5
Cedar Keys, Florida	67.6	55.0	12.6	9	8	60.7
Charleston, South Carolina	58.5	49.4	9.1	41	8	53.7
Chicago, Illinois*	35.9	31.8	4.1	6	11	28.4
Chincoteague, Virginia*	52.0	31.0	21.0	4	0	40.8
Cleveland, Ohio*	40.2	31.6	8.6	14	0	30.0
Detroit, Michigan*	39.7	33.0	6.7	23	3	30.5
Delaware Breakwater, Delaware	52.7	32.5	20.2	8	3	39.5
Duluth, Minnesota*	36.5	34.2	2.3	9	11	10.3
Eastport, Maine	43.1	38.7	4.4	15	0	26.3
Escanaba, Michigan*	38.2	32.9	5.3	17	0	19.7
Galveston, Texas	63.3	46.2	17.1	12	2	57.6
Grand Haven, Michigan*	35.0	39.2	5.8	19	0	28.4
Indianola, Texas	68.2	41.5	26.7	8	0	54.0
Jacksonville, Florida	62.5	58.8	3.7	18	0	58.4
Key West, Florida	78.9	70.7	8.2	16	10	73.0
Mackinaw City, Michigan*	39.1	31.5	7.6	10	0	25.1
Macon, Fort, North Carolina	59.3	43.0	16.3	6	9	48.8
Marquette, Michigan*	38.0	34.7	3.3	10	0	20.4
Milwaukee, Wisconsin*	37.3	34.3	3.0	8	0	22.7
Mobile, Alabama	59.1	49.6	9.5	14	9	53.9
New Haven, Connecticut	44.5	30.5	14.0	15	2	31.5
New London, Connecticut	46.4	38.3	8.1	11	7	34.5
New York City	44.0	34.0	10.0	15	6	34.6
Norfolk, Virginia	52.0	37.1	14.9	16	6	45.2
Pensacola, Florida	63.1	52.0	11.1	17	5	56 0
Portland, Maine	40.9	30.5	10.4	13	7	30.7
Portland, Oregon	45.4	31.4	14.0	53	9	31.0
Sandusky, Ohio*	39.5	34.0	5.5	8	11	30.9
Sandy Hook, New Jersey	47.5	34.6	12.9	2	0	36.1
San Francisco, California	55.2	51.0	4.2	34	4	52.5
Savannah, Georgia	56.8	47.8	9.0	10	0	54.4
Smithville, North Carolina	59.0	48.5	10.5	10	5	49.3
Toledo, Ohio*	36.4	32.4	4.0	11	9	30.0
Wilmington, North Carolina	56.7	43.0	13.7	19	6	51.2

* Observations interrupted by ice.—See text. † Record for 29 days.

Observations were interrupted by ice during the month as follows: Alpena, Michigan, from 17th to 31st; Buffalo, New York, from 19th to 28th; Chincoteague, Virginia, 20th; Cleveland, Ohio, on 9th, 15th, 18th, and from 20th to 31st; Detroit, Michigan, from 8th to 31st; Duluth, Minnesota, from 16th to 31st; Escanaba, Michigan, 14th, 15th, and from 18th to 31st; Grand Haven, Michigan, from 18th to 27th; Mackinaw City and Marquette, Michigan, from 18th to 31st; Milwaukee, Wisconsin, from 13th to 31st; Sandusky, Ohio, from 16th to 31st; Toledo, Ohio, 3d, 4th, and from 17th to 31st.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays occurred during December as follows:

Beloit, Wisconsin, 8th: an auroral arch above a dark cloud was observed at 9. 30 p. m.

Fort Totten, Dakota, 8th: an auroral light of pale yellow color, with dark segment beneath, was observed from 9.20 to 11.45 p. m.

Riley, Illinois, 10th.

Saint Vincent, Minnesota, 15th: at 5.30 p. m. a faint auroral display was observed.

Moorhead, Minnesota, 15th: an aurora was observed at 5.15 a. m., consisting of a pale glow and an arch resting upon a dark segment. In the evening on the same day a similar display was observed, appearing at 6.15 and continuing until early morning of the 16th.

Boyne, Michigan, 19th: auroral light extending to an altitude of 15°.

Alpena, Michigan, 19th: an aurora was observed at 9 p. m., consisting of a diffuse light on the northeastern horizon; no streamers were observed; the display ended at 11 p. m.

Escanaba, Michigan, 19th: a faint aurora of pale yellow color was observed from 10 to 10.50 p. m.

Le Roy, New York, 19th: aurora at 8.30 p. m.

Eastport, Maine, 19th: a faint auroral light of straw color was observed from 8 to 10 p. m.

Point Judith, Rhode Island, 20th: an auroral display was observed at 1.13 a. m., consisting of two yellow beams which remained visible twenty minutes; at 2 a. m. a low arch formed which remained until 3 a. m.

Fort Totten, 22d: an aurora in the north with shooting beams of 20° altitude was observed from 9 to 11.50 p. m.

Saint Vincent, Minnesota, 22d: a faint auroral display was noted from 7.10 to 11 p. m.; it consisted of a poorly defined arch of light of 15° altitude, extending over the northern horizon.

Escanaba, Michigan, 22d: an auroral display was visible from 10.15 p. m. until the early morning of the 23d; it consisted of a dark segment beneath a bright yellow light, from which beams extended to an altitude of 45°.

At Harvard College, Cambridge, Massachusetts, auroras were suspected on the following dates: 16th, 3 a. m.; 29th, 11 p. m.; 20th, 8.30 p. m.; 30th, 8.30 p. m.

The "Canadian Weather Review" for December, 1884, reports auroras as follows:

Winnipeg, Manitoba, 8th, 9th, 14th, 15th, 20th, 21st, 22d.

Halifax, Nova Scotia, 14th.

Charlottetown, Prince Edward Island, 14th, 19th, 27th.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the different states and territories as follows:

Alabama.—Birmingham, 11th, 21st; Greensborough, 20th; Mobile, 22d.

Arizona.—Maricopa, 7th; Tucson, 8th; Wickenburg and Prescott, 7th, 8th; Fort Grant, 7th, 9th; Fort McDowell, 7th, 8th, 9th, 10th, 12th, 26th, 27th.

Arkansas.—Fort Smith, 4th, 26th, 30th; Lead Hill, 5th, 26th, 30th: Mount Ida, 28th, 29th, 30th.

California.—Fort Bidwell, 3d, 21st; Poway, 7th, 11th; Los Angeles, 8th; San Francisco and San Raphael, 24th, 25th; Oakland, 25th; at Salinas City, thunder was occasionally heard from 17th to 24th.

Table of miscellaneous meteorological data for December, 1884—Signal Service observations.

Stations.	Elevation above sea-level.	Atmospheric pressure.								Temperature of the air (in degrees Fahrenheit).																Winds.									
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.					Daily ranges.			Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal	Total movement.	Prevailing direction.	Max. velocity.		Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
					Highest barometer	Date.	Lowest barometer	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min	Monthly range.	Greatest.	Date.	Least.	Date.						Miles p.hr	Direction.					
New England.																																		
Eastport	61	29.98	+.08	30.05	30.78	27	29.28	7	1.50	26.3	+1.0	51.3	7	33.5	—21.0	20	9.5	72.3	48.1	21	3.4	29	78.9	20.5	8.63	+5.22	8,219	n.	48	se.	15	14	13	12	5
Portland	45	30.04	+.08	30.09	30.80	27	29.34	7	1.46	30.7	+3.2	59.0	7	38.3	— 6.1	20	24.5	65.1	29.0	21	5.6	6	77.3	24.3	6.42	+3.79	6,426	n.	35	se.	7	10	9	18	4
Mount Washington	6,279	23.51	.....	30.14	30.76	29	29.59	7	1.17	11.9	+3.0	43.0	31	21.2	—42.2	19	4.2	85.2	40.1	20	3.3	6	92.8	12.0	4.70	—0.70	11,410	nw.	96	nw.	19	12	0	12	19
Thatcher's Island	48	.....	.....	.....	.....	..	.....	...	.....	34.2	+2.0	54.1	8	41.3	—	7	27.2	61.3	.....	...	.....	...	.....	.....	5.82	+2.08	.....	.....	...	.....	...	13	...	...	...
Boston	122	29.98	+.08	30.12	30.74	27	29.47	7	1.27	33.1	+2.9	62.1	31	41.3	—	9	26.2	71.6	55.4	21	4.5	12	70.8	24.2	4.46	+0.89	8,730	nw.	44	s.	21	13	13	12	6
Point Judith	.....	.....	.....	.....	.....	...	.....	...	.....	34.3	.....	58.0	7	41.0	—	8	20.2	77.6	36.0	.....	.....	...	.....	.....	5.04	.....	.....	.....	...	.....	...	14	...	...	...
Block Island	27	30.10	.....	30.14	30.68	27	29.58	7	1.10	37.0	+1.2	60.0	7	44.0	—	3	22.0	31.3	63.2	36.7	21	5.4	2	84.4	32.6	6.56	+2.44	13,603	ne.	44	ne.	26	13	13	15	3
Narragansett Pier	.....	.....	.....	.....	.....	...	.....	...	.....	33.8	.....	59.0	7	41.2	—	9	20.0	26.5	68.0	.....	.....	...	.....	.....	6.34	.....	.....	.....	...	.....	...	19	...	...	...
New London	47	30.11	+.10	30.16	30.73	27	29.58	7	1.15	34.5	+2.5	57.3	7	41.3	—	5	22.0	27.7	62.5	44.7	21	3.4	13	81.7	29.2	7.30	+4.14	6,124	nnw.	40	se.	7	17	10	13	8
New Haven	107	30.03	.....	30.15	30.72	27	29.57	7	1.15	31.5	—0.1	60.0	7	39.9	—	9	5.2	0	24.0	69.5	48.3	21	6.2	24	79.5	25.4	6.41	+3.28	6,701	n.	29	se.	7	15	8	14	9
Middle Atlantic states.																																		
Albany	75	30.07	+.07	30.17	30.83	27	29.48	7	1.35	27.8	—1.0	57.9	7	35.2	—15.9	20	20.5	73.8	36.4	28	2.5	14	72.7	19.9	3.20	+0.49	4,841	n.	32	sw.	7	14	15	14	2
New York	164	29.98	+.06	30.17	30.72	20	29.52	7	1.18	34.6	+1.2	60.0	31	41.7	1.	2	20	28.5	58.8	28.3	21	6.5	24	79.5	28.6	6.66	+3.08	8,419	nw.	40	nw.	9	14	13	13	5
Sandy Hook	28	30.15	+.08	30.18	30.70	27	29.50	6	1.14	36.1	+1.1	61.3	31	43.6	0.	8	20	29.9	60.5	33.9	21	5.3	22	79.0	30.0	5.64	+1.92	13,861	n.	60	n.	19	15	13	12	6
Barnegat City	22	30.14	+.07	30.16	30.64	27	29.62	6	1.02	38.6	+3.5	62.1	7	46.4	—	0.	2	20	31.6	62.3	30.3	20	8.1	31	83.8	34.0	7.69	+2.86	12,077	n.	56	s.	6	12	13	11	7
Little Egg Harbor	.....	.....	.....	.....	.....	...	.....	...	.....	37.6	.....	59.4	7	44.9	—	2.	0	20	30.3	61.4	.....	...	.....	.....	5.92	.....	.....	.....	...	.....	...	13	...	...	...
Atlantic City	13	30.14	+.05	30.15	30.62	20	29.59	6	1.04	37.5	+1.6	61.0	7	44.4	2.	1	20	31.5	58.9	24.9	20	5.8	31	83.0	32.5	7.71	+3.85	6,977	nw.	32	e.	12	13	12	10	9
Cape May	27	30.14	.....	30.17	30.64	20	29.63	6	1.00	40.0	+2.6	59.0	30	46.7	4.	6	20	33.8	54.4	32.1	21	5.3	11	79.3	34.0	6.87	+2.72	12,567	n.	60	w.	9	10	16	8	7
Philadelphia	117	30.06	+.05	30.18	30.68	26	29.56	6	1.12	34.6	—0.3	66.0	31	41.2	0.	8	20	28.2	65.2	28.9	21	4.6	25	74.7	26.8	3.28	+0.74	7,593	nw.	40	s.	6	11	13	13	5
Baltimore	45	30.15	+.06	30.20	30.68	27	29.54	6	1.14	37.4	+0.2	66.2	31	44.4	8.	6	20	31.8	57.6	20.8	6	6.6	25	68.6	27.5	3.91	+0.80	3,928	n.	28	nw.	9	14	13	8	10
Washington City	106	30.08	+.05	30.20	30.70	27	29.58	6	1.12	36.0	+0.9	66.6	31	43.3	6.	1	19	29.7	60.5	25.0	4	4.3	14	79.4	29.7	4.70	+1.78	4,392	s:nw.	30	w.	9	14	15	11	5
Delaware Breakwater	20	30.15	+.05	30.17	30.64	20	29.60	6	1.03	39.5	+1.7	60.8	15	45.0	8.	9	20	34.2	51.9	24.6	15	2.8	23	83.1	34.4	3.22	+0.83	13,721	sw.	51	nw.	9	12	9	16	6
Ocean City	.....	.....	.....	.....	.....	...	.....	...	.....	38.8	.....	61.0	7	47.0	8.	0	20	32.6	69.0	.....	.....	...	.....	.....	6.04	.....	.....	.....	...	.....	...	16	...	...	...
Chincoteague	8	30.16	+.04	30.17	30.62	20	29.63	6	1.00	40.8	+2.3	62.2	30	47.5	9.	0	20	33.6	53.2	31.6	21	5.5	26	82.1	35.4	5.75	+2.09	9,182	n.	45	nw.	9	19	12	14	5
Cape Henry	16	30.16	+.04	30.18	30.61	20	29.68	6	0.94	44.9	+1.3	71.8	12	52.9	15.	3	19	38.1	56.5	30.0	18	3.7	28	76.1	37.4	3.49	—0.99	11,185	n.	54	nw.	9	14	12	13	5
Norfolk	30	30.15	+.04	30.18	30.60	20	29.72	6	0.88	45.2	+2.8	70.0	12	52.5	12.	2	19	38.2	57.8	30.2	18	4.8	1	76.8	37.8	4.30	+0.56	6,308	n.	32	s.	6	16	12	15	4
Lynchburg	652	29.47	+.05	30.20	30.65	27	29.62	6	1.03	40.1	+2.0	68.0	12	47.9	5.	5	19	32.4	62.5	32.9	18	6.4	20	75.6	32.4	11.81	+8.51	2,728	n.	19	nw.	16	10	13	14	4
South Atlantic states.																																		
Kitty Hawk	22	30.17	+.02	30.18	30.58	20	29.74	7	0.83	48.5	+3.6	69.8	31	55.1	14.	7	19	41.2	55.1	25.1	21	5.0	28	80.0	42.2	5.65	+0.45	12,772	n.	60	n.	18	16	18	8	5
Hatteras	12	30.15	+.03	30.16	30.52	28	29.78	18	0.74	50.4	+2.4	51.0	15	57.5	20.	2	19	44.3	50.8	24.3	21	3.2	28	84.9	45.7	7.41	+1.09	10,336	ne.	41	n.	18	14	17	10	4
Fort Macon	11	30.17	+.04	30.18	30.55	20	29.82	18	0.74	48.8	+0.5	68.1	30	55.0	15.	2	19	40.8	52.9	30.9	21	3.5	22	81.8	43.4	5.40	+1.36	11,824	n.	44	nw.	18	20	12	13	6
Wilmington	52	30.13	+.05	30.19	30.55	20	29.78	18	0.78	51.2	+3.3	74.9	31	60.6	16.	6	20	42.4	58.3	30.2	23	6.0	26	75.7	43.2	3.52	+0.07	5,359	ne.	30	sw.	15	15	14	9	8
Smithville	34	30.16	+.04	30.20	30.54	27	29.81	18	0.73	49.3	+0.9	69.9	8	56.1	15.	9	20	40.1	54.0	28.9	18	7.2	26	81	43.3	2.93	—0.79	7,210	ne.	48	se.	15	15	11	10	10
Charlotte	808	29.32	+.05	30.21	30.62	27	29.69	6	0.93	44.1	+1.1	71.0	12	52.4	11.	0	19	35.8	60.0	31.2	18	7.8	26	72.7	34.8	5.72	+0.55	3,861	ne.	24	s.	6	14	9	14	8
Atlanta	1,129	28.97	+.01	30.20	30.52	27	29.74	6	0.78	45.1	—0.5	66.5	22	52.5	11.	0	19	36.7	55.5	36.2	18	5.0	30	73.1	35.9	6.09	+0.07	8,192	e.	30	nw.	18	12	9	16	6
Augusta	183	30.02	+.03	30.22	30.62	27	29.74	6	0.89	50.7	+3.2	74.6	22	60.1	23.	0	20	41.6	51.6	34.6	22	9.0	24	73.4	41.5	4.19	+0.26	2,116	ne.	19	sw.	22	14	11	14	4
Charleston	52	30.11	+.01	30.17	30.51	27	29.76	6	0.75	53.7	+2.3	70.0	12	60.3	26.	0	20	46.3	44.0	28.2	21	7.0	22	81.7	47.9	3.26	—0.33	5,112	ne.	28	s.	6	11	12	12	7
Savannah	87	30.08	+.01	30.18	30.51	27	29.80	6	0.71	54.4	+1.8	75.5	11	62.5	27.	5	20	45.4	48.0	32.2	21	8.3	25	74.6	45.8	3.21	—0.22	4,521	n.	25	sw.	6	12	12	9	10
Jacksonville	43	30.11	.00	30.16	30.41	27	29.84	6	0.56	58.4	+2.2	74.6	12	65.9	32.	9	19	51.4	41.7	26.1	18	2.9	25	86.2	53.9	4.04	+1.15	4,265	n.	24	s.	6	12	15	9	5
Florida peninsula.																																		
Sanford	50	30.06	.....	30.10	30.28	19	29.85	6	0.43	65.5	.....	84.6	12	74.5	37.	4	3	54.3	47.2	35.9	12	9.5	31	79.0	58.1	2.51	.....	3,735	n.	20	n.	19	10	5	18	8
Cedar Keys	22	30.11	—.02	30.13	30.34	19	29.80	6	0.53	60	+1.2	74.1	30	66.6	32.	2	19	55.1	41.9	25.3	18	4.3	23	83.5	55.4	5.66	+2.93	5,774	ne.	28	nw.	18	11	7	8	16
Key West	20	30.06	—.02	30.08	30.20	29	29.91	5	0.29	73.0	+2.5	82.2	6	77.7	62.	0	2	70.0	20.2	12.3	4	2.9	7	82.9	67.3	1.68	—0.16	7,238	ne.	28	ne.	3	11	3	17	11
Eastern Gulf states.																																		
Montgomery	219	29.91	—.03	30.15	30.45	19	29.69	5	0.77	51.2	+1.7	77.1	22	60.3	16.	0	19	41.5	61..1	34.5	18	8.1	1	75.9	43.0	4.00	—1.53	4,636	se.	22	w.	6	12	14	12	5
Pensacola	30	30.09	—.04	30.12	30.41	19	29.72	5	0.70	56.0	+0.8	73.6	11	63.7	23.	0	19	48.6	50.6	40.1	18	3.4	5	81.5	49.8	5.60	+0.28	6,294	e.	24	se.	5	12	13	11	7
Mobile	35	30.09	—.03	30.13	30.45	19	29.68	5	0.76	53.9	+1.7	78.8	22	62.5	20.	3	19	45.0	58.5	30.2	18	8.6	25	83.5	48.4	5.10	+0.39	5,236	e.	24	se.	11	13	12	10	9
Vicksburg	244	29.85	—.06	30.12	30.51	19	29.68	5	0.82	50.9	+0.4	73.8	11	59.6	18.	1	19	41.8	55.7	30.2	22	7.0	28	72.5	41.5	14.09	+8.81	5,750	se.	27	sw.	11	13	17	7	7
New Orleans	52	30.02	—.08	30.08	30.46	19	29.68	5	0.78	58.7	+3.4	76.5	22	65.6	28.	8	19	51.8	47.7	32.5	18	2.7	13	77.0	50.9	8.01	+3.16	7,090	n.	28	se.	28	15	13	11	8
Western Gulf states.																																		
Fort Smith	451	29.60	—.06	30.10	30.56	18	29.61	5	0.95	36.8	—3.8	72.5	4	46.5	12.	2	24	29.5	60.3	38.8	30	5.0	14	80.1	30.8	6.30	+3.85	4,404	w.	24	w.	11	12	12	13	6
Little Rock	298	29.77	—.07	30.10	30.52	18	29.61	5	0.91	41.2	—4.9	69.0	4	49.1	13.	0	19	34.2	56.0	29.0	4	6.0	29	81.7	35.8	16.92	*	3,600	e.	22	se.	30	13	12	12	7
Shreveport	227	29.83	—.08	30.08	30.49	25	29.67	21	0.82	40.7	—2.3	74.4	4	57.2	19.	6	19	38.2	54.8	32.0	27	6.0	29	77.3	39.2	15.55	†	3,907	se.	26	se.	30	12	17	8	6
Palestine	533	29.51	—.08	30.09	30.52	25	29.67	4	0.85	45.1	—4.9	76.2	4	56.4	15.	2	25	35.6	61.0	39.0	17	9.5	29	73.6	36.3	6.94	+3.58	72,96	ne.	34	s.	4	11	11	13	7
Indianola	20	30.01	—.09	30.04	30.43	25	29.66	4	0.76	54.0	—2.4	76.6	10	62.9	25.	1	25	46.0	51.5	34.0	31	5.5	8	80.3	49.6	2.05	—1.26	10,921	n.	46	n.	18	20	7	17	7
Galveston	40	30.00	—.10	30.04	30.38	19	29.71	4	0.67	57.6	+1.2	72.5	21	65.0	29.	3	18	50.5	43.2	34.6	31	7.0	4	83.5	52.4	9.44	+5.44	9,183	s.	36	n.	31	16	10	15	7
Rio Grande valley.																																		
Rio Grande City	230	29.83	—.10	30.08	30.47	25	29.71	4	0.77	58.1	—1.5	83.1	10	68.1	34.	0	25	49.6	49.1	34.6	6	5.4	13	72.8	47.9	0.33	—1.23	3,765	n.	24	nw.	5	8	8	13	10
Brownsville	57	29.95	—.12	30.01	30.38	18	29.68	4	0.70	60.2	—1.0	82.6	11	70.3	30.	0	25	52.5	52.6	37.6	31	6.5	13	84.4	54.9	1.33	—0.98	6,061	n.	27	s.	0	10	7	19	5
Tennessee.																																		
Nashville	549	29.54	—.03	30.15	30.58	19	29.53	6	1.05	40.4	—0.9	67.0	30	49.5	0.	9	19	31.2	66.1	32.9	31	4.7	25	77.8	33.7	3.78	—0.05	5,810	se.	30	w.	14	10	20	8	3
Memphis	321	29.78	—.04	30.14	30.60	19	29.61	5	0.98	41.3	—1.3	68.1	4	49.4	8.	1	19	33.5	60.0	33.2	31	4.5	13	78.7	34.8	9.14	+5.46	5,559	se.	28	nw.	18	16	17	12	2
Chattanooga	783	29.32	—.02	30.18	30.50	19	29.66	6	0.84	43.1	—0.6	64.8	11	52.2	8.	3	19	34.9	56.5	26.8	18	7.8	30	73.4	34.7	6.80	+0.96	4,664	s.	28	sw.	6	14	17	8	6
Knoxville	980	29.11	—.02	30.19	30.49	8	29.61	6	0.88	40.2	+1.0	69.5	29	49.3	5.	2	19	31.7	64.3	29.6	29	6.7	13	75.5	32.3	6.11	+1.76	4,107	ne.	36	sw.	6	13	12	13	6
Ohio valley.																																		
Pittsburg	766	29.29	+.01	30.15	30.56	26	29.47	6	1.10	34.3	+0.9	67.2	5	43.7	—	2.	0	19	26.4	69.2	30.2	22	8.6	13	80.5	28.6	4.07	+1.13	5,018	w.	36	w.	9	16	16	13	2
Columbus	805	29.25	+.01	30.16	30.65	19	29.41	6	1.24	31.9	—0.5	59.6	5	40.3	—	7.	9	19	24.1	67.5	33.3	27	6.5	12	82.0	26.8	2.77	—1.20	6,282	s.	43	w.	7	14	17	10	4
Indianapolis	753	29.30	+.01	30.15	30.64	19	29.39	6	1.24	29.9	—3.0	60.7	5	37.1	—12.	3	19	22.5	73.0	39.2	31	4.0	12	85.2	25.8	6.05	+2.72	4,829	se.	20	sw.	7	20	20	6	5
Greencastle	.....	29.16	.....	.....	.....	...	.....	...	1.21	28.0	.....	59.3	6	35.9	—14.	5	19	20.5	73.8	44.8	31	6.4	21	83.9	23.6	6.74	.....	6,492	se.	30	s.	31	29	22	4	5
Cincinnati	620	29.48	.00	30.18	30.68	19	29.43	6	1.25	36.1	—0.8	65.9	31	44.0	—	2.	8	19	28.3	68.7	37.2	31	4.8	12	75.0	28.7	3.99	+0.01	4,615	e.	25	w.	6	17	18	10	3
Louisville	530	29.56	—.02	30.16	30.65	19	29.48	6	1.17	37.6	—0.4	65.5	30	45.4	—	5.	0	19	30.1	70.5	36.4	31	5.9	13	76.9	30.7	5.11	+0.64	6,111	n.	31	sw.	14	16	21	3	7
Lower lake region.																																		
Detroit	661	29.36	+.01	30.12	30.65	26	29.32	6	1.33	30.5	+1.8	60.0	6	37.0	—	6.	1	19	23.5	66.1	31.8	31	3.8	21	73.2	23.0	3.05	+0.27	8,601	s.	39	sw.	8	24	16	9	4
Toledo	651	29.40	+.03	30.14	30.65	19	29.34	6	1.31	30.0	—1.1	59.0	4	36.1	—	8.	5	19	22.7	67.5	33.9	31	3.0	12	77.8	23.9	2.03	—0.42	6,480	sw.	37	sw.	7	20	19	9	3
Sandusky	639	29.41	+.02	30.14	30.65	26	29.36	6	1.29	30.9	—1.9	62.0	30	37.0	—11.	3	19	23.2	73.3	35.6	31	4.6	12	74.1	23.6	2.44	—0.53	10,380	sw.	45	w.	9	21	20	8	
Cleveland	690	29.35	+.01	30.14	30.67	22	29.40	6	1.27	30.0	—0.2	61.7	30	37.4	—	4.	6	19	22.8	66.3	34.2	31	3.6	12	81.2	24.7	1.83	—1.00	9,998	w.	40	w.	15	22	17	11	3
Erie	681	29.35	+.03	30.12	30.65	26	29.32	6	1.32	33.6	+0.9	61.2	31	38.7	—	5.	9	19	26.7	55.3	31.4	31	4.2	13	76.0	26.7	3.84	+0.44	10,465	s.	41	w.	7	20	24	5	3
Buffalo	690	29.33	+.05	30.12	30.71	26	29.34	6	1.37	29.8	+0.5	57.9	30	35.7	—	3.	5	19	24.0	61.4	26.9	27	3.5	13	86.4	26.2	3.07	—0.35	10,855	w.	64	sw.	15	18	22	8	2
Rochester	621	29.40	+.02	30.11	30.72	26	29.33	6	1.39	29.1	+1.8	64.9	31	38.2	—10.	5	20	22.4	75.4	31.3	31	5.2	13	80.1	23.5	2.62	—0.45	15,388	sw.	54	w.	15	17	26	4	1
Oswego	334	29.72	.00	30.10	30.73	26	29.34	6	1.39	27.5	—2.6	58.4	31	34.7	—17.	5	20	20.6	75.9	36.9	27	5.0	1	80.5	22.1	2.61	—1.07	10,638	se.	44	w.	23	17	24	5	1
Upper lake region.																																		2
Duluth	644	29.36	+.06	30.18	30.73	25	29.62	3	1.11	10.3	—6.7	47.2	4	16.9	—32.	5	18	2.6	79.7	40.1	26	5.2	7	79.0	5.0	1.22	—0.20	5,434	nw.	42	nw.	31	18	13	13	5
Marquette	673	29.29	+.03	30.07	30.65	25	29.57	7	1.08	20.4	—2.0	47.0	3	26.8	—15.	9	17	11.4	62.9	30.0	27	4.1	5	76.9	14.0	8.65	+7.06	7,221	w.	28	nw.	9	22	18	11	2
Escanaba	612	29.34	.00	30.06	30.68	25	29.40	6	1.24	19.7	—1.0	45.5	4	26.4	—14.	1	20	13.5	59.6	30.0	26	4.1	6	74.9	13.1	4.34	+2.82	6,719	nw.	33	nw.	22	20	17	10	4
Milwaukee	697	29.29	.00	30.10	30.67	25	29.33	6	1.34	22.7	—2.0	49.1	31	29.4	—21.	6	19	15.0	70.5	39.8	31	4.5	12	85.4	18.9	2.37	—0.58	9,338	nw.	41	sw.	31	19	14	13	4
Chicago	661	29.36	.00	30.12	30.65	25	29.34	6	1.32	28.4	—0.6	61.2	30	37.8	—11.	2	19	22.2	72.4	43.3	31	8.0	28	79.6	22.8	4.21	+2.26	6,574	sw.	29	sw.	31	18	18	9	4
Grand Haven	620	29.37	.00	30.08	30.67	25	29.29	6	1.38	28.4	—1.1	59.0	30	34.5	—12.	0	26	23.0	71.0	36.4	31	2.9	6	81.1	23.3	6.80	+1.56	9,749	e.	48	w.	7	19	25	6	0
Mackinaw City	605	29.35	+.01	30.05	30.65	25	29.36	6	1.29	25.1	—0.6	47.5	29	29.7	—	5.	0	18	19.1	52.5	34.1	31	3.5	6	80.6	20.0	6.48	.....	8,041	nw.	44	e.	22	20	26	5	0
Alpena	609	29.33	—.01	30.04	30.64	25	29.29	6	1.34	23.2	—0.7	50.1	31	29.4	—10.	0	19	16.4	60.1	38.8	31	4.0	30	84.0	19.0	5.58	+3.52	6,102	w.	29	sw.	31	19	15	15	4
Port Huron	633	29.35	+.01	30.08	30.66	26	29.40	7	1.26	25.9	—1.3	56.2	31	32.9	—10.	8	19	19.4	67.0	29.3	31	6.5	6	87.0	22.4	3.01	+0.65	8,176	s.	48	w.	31	19	15	12	1

Table of miscellaneous meteorological data for December, 1884—Signal Service observations—Continued.

Stations.	Elevation above sea-level.	Atmospheric pressure.								Temperature of the air (in degrees Fahrenheit).																Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal	Winds.					
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.						Monthly range.	Daily ranges.				Mean.							Total movement.	Prevailing direction.	Max. velocity.		No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
					Highest barometer	Date.	Lowest barometer	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min		Greatest.	Date.	Least.	Date.										Miles p.hr.	Direction.	Date.				
Extreme northwest.																																				
Fort Buford	1,930	28.05	+.01	30.32	30.76	31	29.77	3	0.99	1.7	— 7.3	56.8	1	10.8	—39.8	22	-6.7	96.6	43.4	25	7.8	12	74.9	-4.4	0.40	—0.69	6,062	w.	34	w.	9	7	7	19	5
Bismarck	1,694	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...
Fort Totten	.....	28.45	.....	.....	.....	...	.....	...	1.00	2.0	.....	43.0	2	9.1	—35.0	31	-7.4	78.0	28.5	9	6.0	12	77.4	-3.5	0.48	.....	9,157	nw.	38	nw.	20	11	8	13	10
Moorhead	923	29.12	+.06	30.22	30.77	25	29.59	3	1.17	6.0	— 3.8	49.0	2	13.5	—31.0	25	-2.1	80.0	24.8	9	5.5	6	84.9	2.8	0.76	+0.06	5,104	n.	43	s.	25	12	12	13	6
Saint Vincent	804	29.23	+.05	30.32	30.71	18	29.57	3	1.15	0.7	— 4.6	44.8	2	10.4	—47.8	23	-9.2	92.6	30.7	24	8.2	6	85.3	-2.9	0.85	+0.20	6,550	nw.	30	nw.	8	11	7	11	13
Upper Mississippi valley.																																				
Saint Paul	807	29.21	+.03	30.16	30.78	25	29.62	3	1.15	14.9	— 4.1	49.2	3	22.7	—27.0	25	7.0	76.2	28.0	31	6.2	7	72.3	7.3	1.98	+0.79	5,522	nw.	30	w.	8	13	15	7	9
La Crosse	725	29.30	+.02	30.15	30.78	25	29.51	6	1.27	17.2	— 5.9	46.0	4	23.9	—26.0	25	11.1	72.0	38.5	26	3.5	7	74.3	10.4	2.25	+1.05	5,225	n.	28	nw.	8	15	15	9	7
Dubuque	665	29.38	.....	30.15	30.75	25	29.43	6	1.32	21.3	— 4.9	53.3	3	29.2	—17.1	19	13.7	70.4	36.6	31	3.7	6	71.1	13.2	4.68	+2.48	3,071	nw.	20	w.	31	18	18	8	5
Davenport	615	29.44	+.02	30.16	30.70	18	29.38	6	1.31	25.1	— 2.1	50.7	4	33.0	— 9.8	18	19.0	66.5	33.5	31	4.9	29	76.3	18.6	3.68	+2.15	6,034	nw.	35	w.	31	10	14	13	4
Des Moines	849	29.22	+.02	30.20	30.75	24	29.59	6	1.16	18.4	— 6.2	50.4	3	25.1	—18.2	19	11.8	68.6	23.8	26	3.2	6	72.7	11.2	1.93	+0.46	4,241	n.	18	n.	31	14	16	12	3
Keokuk	618	29.45	+.01	30.16	30.70	18	29.45	6	1.25	23.0	— 5.6	58.7	4	30.3	—12.7	19	17.2	71.4	30.8	31	4.1	13	82.0	18.3	3.91	+1.79	5,215	nw.	24	nw.	22	8	14	13	4
Springfield	644	29.44	+.01	30.17	30.70	19	29.41	6	1.28	29.1	— 3.3	60.0	5	30.8	— 8.8	19	22.4	68.8	42.9	31	5.8	7	76.4	22.4	5.19	+2.17	7,066	s.	32	w.	31	15	19	7	5
Saint Louis	583	29.51	—.02	30.16	30.67	18	29.49	6	1.18	32.8	— 1.6	66.3	4	41.2	— 7.0	19	26.1	73.3	46.2	31	6.0	10	74.3	25.4	6.18	+3.99	9,294	se.	40	w.	31	17	18	9	4
Cairo	377	29.75	—.04	30.17	30.66	19	29.56	6	1.10	36.2	— 2.3	63.6	4	43.1	— 2.2	19	29.7	65.8	37.3	31	3.0	13	78.0	29.9	8.97	+5.65	7,095	n.	33	w.	31	15	17	11	3
Missouri valley.																																				
Fort Bennett	1,510	28.53	.....	30.29	30.84	24	29.74	5	1.10	9.4	—10.1	58.0	1	19.3	—41.3	25	-0.9	99.3	45.7	25	4.4	30	82.0	4.4	0.46	+0.02	5,094	nw.	28	nw.	10	9	9	15	7
Fort Sully	.....	.....	.....	.....	.....	...	.....	...	.....	8.8	.....	59.1	1	19.7	—39.5	25	-0.2	89.6	.....	...	.....	...	.....	.....	0.89	.....	.....	.....	...	.....	...	12	...	...	...
Yankton	1,228	28.82	+.04	30.26	30.83	24	29.67	3	1.16	11.8	—10.2	57.4	3	19.4	—23.3	18	4.2	80.7	33.8	3	3.6	30	75.6	5.2	0.80	+0.05	5,574	n.	31	n.	30	11	9	14	8
Huron	1,305	28.72	+.06	30.26	30.80	24	29.71	3	1.09	8.6	—12.3	53.8	2	18.7	—34.2	25	0.7	88.0	32.8	25	5.9	30	73.0	1.5	0.62	+0.52	6,671	nw.	31	se.	25	9	6	15	10
Omaha	1,113	28.96	+.02	30.25	30.81	24	29.71	3	1.09	17.3	— 7.9	54.0	1	25.4	—17.0	22	9.6	71.0	23.5	13	7.0	6	77.5	11.2	0.72	—0.15	6,662	n.	29	n.	30	12	11	15	5
Leavenworth	842	29.21	—.03	30.17	30.70	24	29.60	6	1.10	24.1	— 0.7	60.0	4	31.9	— 6.0	24	18.1	66.0	25.0	20	5.0	9	83.3	19.5	1.48	—0.20	4,862	n.	22	nw.	22	14	14	12	5
Northern slope.																																				
Fort Assinaboine	2,710	27.22	+.07	30.26	30.67	9	29.77	3	0.90	3.5	—16.3	63.8	1	11.2	—50.0	25	-7.9	‡	42.2	25	8.6	13	62.3	-8.0	0.72	—0.12	8,440	sw.	42	sw.	8	13	7	15	9
Fort Benton	2,700	27.29	.....	30.28	30.71	9	29.82	5	0.88	1.5	—20.4	69.2	1	12.2	—56.5	24	-9.0	‡	43.1	25	7.0	12	77.3	-4.8	1.01	+0.45	4,457	sw.	28	sw.	2	13	12	9	10
Fort Shaw	3,550	26.35	.....	30.18	30.69	9	29.74	26	0.92	2.9	—23.3	62.2	1	11.1	—44.5	24	-6.1	‡	54.5	25	4.0	19	64.9	-7.6	2.47	+1.91	5,457	w.	40	sw.	3	15	8	11	12
Helena	4,044	25.78	—.07	30.10	30.57	9	29.04	26	0.93	7.0	—10.7	47.5	3	14.5	—28.0	24	0.5	75.5	34.4	25	7.5	30	67.0	-1.9	1.50	—0.07	2,690	nw.	24	w.	5	11	3	20	8
Fort Custer	3,040	26.87	+.02	30.27	30.65	24	29.82	27	0.83	5.6	—15.0	58.0	2	15.2	—47.5	24	-3.5	.....	34.8	8	5.2	27	77.1	-0.8	0.27	—1.15	.....	n.	10	e.	29	11	13	14	4
Fort Maginnis	4,340	25.50	.....	30.14	30.52	9	29.69	19	0.84	5.7	.....	68.4	1	13.0	—30.0	22	-0.6	98.4	37.5	25	5.7	23	53.6	-7.5	0.82	.....	7,230	w.	48	w.	2	17	12	12	7
Deadwood	4,600	25.25	—.06	30.24	30.58	9	29.78	19	0.80	11.0	—11.4	53.0	1	21.0	—28.0	24	3.3	81.0	48.5	25	7.0	7	72.8	4.1	1.79	+0.28	1,495	ne.	16	ne.	26	17	8	13	10
Cheyenne	6,089	23.82	—.14	30.12	30.50	8	29.60	21	0.90	18.8	— 8.4	61.2	1	31.1	—13.4	16	0.5	74.6	54.5	23	6.4	11	74.1	9.9	0.67	+0.49	7,533	w.	44	w.	19	13	12	9	10
North Platte	2,841	27.08	—.03	30.24	30.72	24	29.78	21	0.94	16.5	— 9.2	65.0	1	25.3	—18.0	22	7.3	83.0	41.0	1	4.4	10	71.6	8.1	0.27	—0.53	5,695	w.	37	se.	19	12	13	11	7
Middle slope.																																				
Denver	5,294	24.59	—.14	30.11	30.49	10	29.58	21	0.91	24.6	— 5.6	68.2	1	30.6	— 8.0	16	12.7	76.2	55.0	23	7.0	10	62.8	11.9	0.76	+0.05	5,089	n.	35	sw.	19	13	4	19	7
Pike's Peak	14,134	17.48	.....	30.14	30.63	1	29.89	21	0.74	5.4	— 1.1	24.5	2	10.3	—20.0	31	0.1	44.5	18.4	15	3.5	11	86.8	2.2	1.50	+0.20	10,099	w.	73	w.	15	10	8	11	12
Dodge City	2,517	27.41	—.05	30.21	30.69	24	29.70	4	1.00	21.0	—10.4	67.2	2	29.9	—11.8	25	13.0	79.0	35.0	1	4.5	12	79.0	14.2	1.10	+0.42	8,882	nw.	47	se.	20	9	9	11	11
West Las Animas	3,905	25.94	—.11	30.09	30.53	31	29.58	21	0.95	19.5	—12.6	69.7	1	34.6	—21.5	31	8.1	91.2	61.3	23	7.1	11	70.6	11.6	0.72	+0.12	4,557	w.	38	n.	4	5	7	14	10
Fort Elliott	2,650	27.22	—.08	30.18	30.64	31	29.61	24	1.03	26.2	— 9.1	67.8	2	30.3	— 2.0	24	16.8	69.8	36.3	3	3.0	17	78.0	19.1	3.05	+2.66	9,453	nw.	60	n.	4	7	9	9	13
Southern slope.																																				
Fort Concho	1,900	28.08	—.11	30.10	30.59	31	29.71	4	0.89	41.2	— 4.8	74.9	2	55.8	8.4	25	31.0	66.5	43.8	23	6.6	9	75.0	32.1	3.57	+2.40	7,183	ne.	34	w.	4	5	9	10	12
Fort Stockton	3,010	26.96	—.10	30.10	30.56	31	29.78	27	0.77	45.2	— 0.3	80.0	3	58.8	13.8	25	33.9	66.2	41.8	19	5.7	12	65.8	31.5	1.27	+0.05	4,987	sw.	44	nw.	4	10	6	15	10
Fort Davis	4,928	25.18	.....	30.11	30.35	1	29.82	27	0.52	45.9	+ 1.6	74.0	23	58.8	18.0	11	32.2	56.0	39.1	1	10.0	8	65.2	30.0	0.48	+0.08	0,085	sw.	36	sw.	20	4	9	7	15
Fort Stanton	.....	.....	.....	.....	.....	...	.....	...	.....	29.9	.....	59.0	17	49.0	— 1.3	30	19.8	60.3	.....	...	.....	...	.....	.....	1.44	.....	.....	.....	...	.....	...	6	...	...	...
Southern plateau.																																				
Prescott	5,389	24.62	—.17	30.04	30.40	1	29.68	27	0.72	33.6	+ 0.1	64.0	2	45.0	— 4.5	31	22.7	68.5	41.2	3	6.4	27	69.7	22.7	5.58	+3.81	4,920	sw.	31	se.	7	12	8	9	14
Wickenburg	.....	.....	.....	.....	.....	...	.....	...	.....	40.7	+ 0.4	82.0	1	60.3	22.0	31	33.0	60.0	.....	...	.....	...	.....	.....	5.27	+3.85	.....	.....	...	.....	...	12	...	...	...
Phœnix	.....	.....	.....	.....	.....	...	.....	...	.....	51.6	+ 1.3	83.2	1	67.8	24.8	31	30.1	54.4	.....	...	.....	...	.....	.....	2.74	+1.90	.....	.....	...	.....	...	8	...	...	...
Fort Grant	4,856	25.16	.....	30.04	30.32	1	29.21	27	0.61	44.4	— 0.7	70.5	19	50.0	18.7	31	35.8	51.8	34.4	24	5.4	29	59.2	29.1	5.93	+4.83	4,869	n:ne.	37	se.	8	12	10	7	14
Fort Thomas	2,710	27.23	.....	30.05	30.35	1	29.68	27	0.68	41.7	.....	63.3	7	53.9	17.0	6	29.1	46.3	42.4	7	11.4	29	72.1	32.8	5.16	.....	.....	s.	...	.....	...	10	7	9	15
Fort Apache	5,050	24.90	—.10	30.04	30.37	1	29.67	27	0.69	33.9	— 2.6	63.6	2	47.3	— 8.0	15	21.9	71.0	42.8	2	8.0	27	75.2	25.7	5.52	+3.81	3,684	ne.	33	ne.	4	11	10	7	14
San Carlos	.....	.....	.....	.....	.....	...	.....	...	.....	44.6	.....	67.0	1	54.1	20.0	6	35.1	47.0	.....	...	.....	...	.....	.....	5.48	.....	.....	.....	...	.....	...	10	...	...	...
Fort Bowie	.....	.....	.....	.....	.....	...	.....	...	.....	45.0	.....	71.0	3	56.0	17.0	31	34.0	54.0	.....	...	.....	...	.....	.....	0.41	.....	.....	.....	...	.....	...	12	...	...	...
Willcox	.....	.....	.....	.....	.....	...	.....	...	.....	45.6	.....	79.5	19	62.4	15.5	5	28.9	64.0	.....	...	.....	...	.....	.....	3.49	.....	.....	.....	...	.....	...	11	...	...	...
El Paso	3,764	26.22	—.10	30.08	30.41	31	29.77	27	0.64	40.9	+ 0.7	72.3	19	61.0	27.4	31	36.5	44.9	40.3	19	9.5	8	51.9	26.8	2.07	+1.48	3,666	w.	24	w.	21	8	7	13	11
Santa Fé	.....	23.15	.....	.....	.....	...	.....	...	0.71	30.9	+ 1.6	54.5	2	41.6	— 2.0	31	21.4	56.5	30.0	18	9.0	20	66.2	19.7	1.77	+1.12	4,499	sw.	27	n.	4	13	11	8	12
Middle plateau.																																				
Salt Lake City	4,348	25.50	—.22	30.04	30.52	31	29.64	21	0.89	35.5	+ 3.3	52.8	18	41.7	6.6	31	28.7	46.2	22.5	3	5.5	29	60.4	23.0	2.12	+0.71	5,410	nw.	32	s.	19	11	16	7	8
Fort Bidwell	.....	.....	.....	.....	.....	...	.....	...	.....	32.0	.....	54.0	1	43.3	2.0	13	20.6	52.0	.....	...	.....	...	.....	.....	6.81	.....	.....	.....	...	.....	...	19	...	...	...
Fort Bridger	.....	.....	.....	.....	.....	...	.....	...	.....	24.9	.....	59.7	2	35.1	— 5.6	11	14.8	65.3	.....	...	.....	...	.....	.....	0.95	.....	.....	.....	...	.....	...	3	...	...	...
Winnemucca	4,332	25.51	.....	.....	.....	...	.....	...	0.83	33.2	+ 2.8	56.2	18	43.9	0.0	31	22.7	50.2	40.0	1	6.5	19	60.0	19.9	3.29	+2.43	7,737	sw.	46	sw.	22	11	9	9	13
Northern plateau.																																				
Dayton	1,667	28.28	.....	30.12	30.66	9	29.81	19	1.13	15.8	—18.4	48.2	3	23.7	—26.0	31	7.2	74.2	30.6	15	3.4	10	82.5	10.9	5.10	+0.15	2,385	sw.	24	sw.	20	19	17	9	5
Lewiston	760	29.28	.....	30.16	30.73	9	29.44	19	1.28	18.5	—15.3	52.6	3	25.1	—16.0	31	11.8	68.6	24.5	15	3.5	17	79.7	13.2	2.79	—0.61	339	sw.	23	nw.	5	10	16	9	6
Spokane Falls	1,910†	27.99	—.06	30.12	30.67	9	29.44	19	1.23	15.5	—16.1	44.4	3	23.5	—17.8	31	8.5	62.1	24.3	31	7.8	8	82.1	10.8	3.28	+0.29	1,874	w.	23	w.	5	19	16	13	2
Cœur d'Alene	.....	.....	.....	.....	.....	...	.....	...	.....	16.0	.....	41.6	4	23.4	—21.0	24	8.8	62.0	.....	...	.....	...	.....	.....	3.22	.....	.....	.....	...	.....	...	17	...	...	...
Boisé City	2,750	27.11	.....	30.09	30.65	31	29.53	26	1.12	28.1	— 4.0	47.7	19	37.3	— 7.3	31	21.1	55.0	25.6	30	6.6	19	80.3	22.7	5.67	+3.79	2,529	se.	19	w.	23	16	15	7	9
Linkville	.....	.....	.....	.....	.....	...	.....	...	.....	29.4	.....	56.0	19	36.5	3.0	30	22.4	53.0	.....	...	.....	...	.....	.....	2.97	.....	.....	.....	...	.....	...	16	...	...	...
Ashland	.....	.....	.....	.....	.....	...	.....	...	.....	32.1	.....	58.0	4	48.3	10.0	12	25.8	48.0	.....	...	.....	...	.....	.....	5.97	.....	.....	.....	...	.....	...	19	...	...	...
Fort Spokane	.....	.....	.....	.....	.....	...	.....	...	.....	10.6	.....	40.0	7	21.9	—27.0	31	-0.5	67.0	.....	...	.....	...	.....	.....	0.42	.....	.....	.....	...	.....	...	7	...	...	...
North Pacific coast region.																																				
Astoria	.....	.....	.....	.....	.....	...	.....	...	.....	35.2	.....	52.0	5	41.3	10.0	16	29.1	42.0	.....	...	.....	...	.....	.....	6.55	.....	.....	.....	...	.....	...	21	...	...	...
Olympia	36	29.93	—.04	29.97	30.49	6	29.21	19	1.28	32.7	— 8.0	54.0	3	39.5	8.0	27	28.0	46.0	22.0	29	3.0	17	82.6	28.0	5.82	—4.34	1,870	s.	20	ne.	26	16	14	14	3
Portland	67	29.91	.....	29.98	30.45	7	29.18	19	1.27	31.0	—10.4	54.8	3	37.5	12.0	16	25.5	42.8	20.5	15	6.5	2	78.5	25.0	7.52	—0.77	3,437	e.	24	e.	6	21	15	11	5
Roseburg	.....	29.39	.....	.....	.....	...	.....	...	1.10	37.4	— 4.2	61.7	18	45.7	19.2	10	31.1	42.5	27.8	22	7.3	15	87.5	33.8	9.20	+3.15	1,531	sw.	...	.....	..	19	17	12	8
Fort Canby	179	29.70	.....	29.90	30.41	7	29.05	18	1.36	32.5	.....	54.0	3	41.7	21.0	24	32.0	33.0	22.3	18	5.2	26	87.0	32.6	5.91	.....	10,348	n	‖	e.	16	17	11	10	8
Port Angeles	.....	.....	.....	.....	.....	...	.....	...	.....	30.4	.....	54.2	4	36.5	5.3	23	24.3	48.9	.....	...	.....	...	.....	.....	3.53	.....	.....	.....	...	.....	...	18	...	...	...
Pysht	.....	.....	.....	.....	.....	...	.....	...	.....	31.5	.....	51.0	4	36.0	15.0	23	27.0	36.0	.....	...	.....	...	.....	.....	5.35	.....	.....	.....	...	.....	...	17	...	...	...
Middle Pacific coast region.																																				
Cape Mendocino	637	29.21	.....	29.91	30.30	5	29.25	25	1.05	48.7	.....	64.6	18	54.0	34.0	29	44.5	30.6	14.1	1	4.6	21	76.6	40.8	2.58	.....	16,870	s.	¶	se.	16	18	15	11	5
Red Bluff	332	29.61	—.15	29.98	30.33	31	29.44	25	0.89	47.5	+ 1.0	69.5	2	59.0	25.0	13	39.7	44.5	30.0	2	7.0	23	65.0	34.0	7.73	+2.71	7,782	n.	48	s.	22	12	10	7	14
Sacramento	65	29.89	—.18	29.96	30.30	31	29.49	25	0.81	48.8	+ 2.1	65.1	1	56.2	27.0	12	41.6	38.0	27.5	2	5.0	18	71.1	38.9	10.45	+7.38	7,817	se.	36	nw.	6	11	10	8	13
San Francisco	60	29.90	—.17	29.97	30.29	41	29.51	25	0.79	52.5	+ 0.9	63.5	5	56.8	40.0	30	45.9	22.5	14.2	4	3.0	22	73.7	43.5	7.68	+2.96	7,256	se.	45	n.	7	14	13	8	10
South Pacific coast region.																																				
Los Angeles	371	29.62	—.09	30.02	30.30	31	29.64	12	0.67	52.4	— 2.3	75.6	1	61.4	35.5	2	44.2	40.1	31.7	2	5.6	19	77.9	44.8	4.65	+0.83	4,335	ne.	34	ne.	8	12	6	10	14
San Diego	67	29.91	—.10	29.98	30.22	31	29.65	12	0.57	54.4	— 0.8	68.3	5	60.6	36.0	15	40.9	32.3	26.5	1	4.0	29	77.6	46.9	5.12	+3.00	4,639	w.	26	sw.	11	13	8	15	8
Yuma	141	29.78	—.10	29.93	30.34	31	29.59	27	0.75	53.0	— 2.9	78.5	1	63.3	36.4	11	43.5	42.1	33.3	4	9.3	29	72.3	43.3	1.96	+1.09	4,014	ne.	25	sw.	27	9	5	9	17

NOTE.—The total movements of the air on Mount Washington, New Hampshire, and Pike's Peak, Colorado, are insufficient on account of frost work.

* +13.40. † +10.91. ‡ Record for 16½ days. § See text under "Ranges of temperature." ‖ 104 miles. ¶ 108 miles.

Delaware.—Delaware Breakwater, 15th, 22d.
Florida.—Archer, 5th, 6th; Tallahassee, 5th, 14th, 22d; Jacksonville, 22d; Pensacola, 21st, 22d; Sanford, 23d.
Georgia.—Athens, 14th; Atlanta, Milledgeville and Savannah, 22d; Augusta and Forsyth, 21st, 22d.
Illinois.—Swanwick, 27th.
Indiana.—Laconia, 28th; Greencastle, 30th.
Kansas.—Emporia, Independence, Wellington, and Yates Centre, 4th.
Louisiana.—Grand Coteau, 4th, 5th, 11th, 17th, 28th; New Orleans, 11th, 17th; Point Pleasant, 20th, 21st; Liberty Hill, 27th to 30th; Shreveport, 29th, 30th.
Maine.—Eastport, 15th; three flashes of lightning were observed at 5.30 a. m.
Maryland.—Baltimore, 31st.
Massachusetts.—Fall River and Taunton, 23d.
Michigan.—Hillsdale, 21st.
Mississippi.—Vicksburg, 14th, 21st.
Missouri.—Pierce City, 4th, 5th; Springfield, 29th.
Nebraska.—Genoa, 4th.
New Jersey.—Moorestown, 15th; Vineland, Cape May, Little Egg Harbor, Barnegat City, and Atlantic City, 22d.
North Carolina.—Kitty Hawk, 12th, 15th, 22d; Hatteras, 14th, 21st; Kelly's (near Raleigh), 15th; Smithville, 15th, 21st, 22d; Fort Macon, 21st; New River Inlet and Wilmington, 21st, 22d; Weldon, 22d; Charlotte, 28th.
Pennsylvania.—Pittsburg, 6th.
Rhode Island.—Narragansett Pier, 22d; heavy thunder-storm from 4.30 to 4.40 a. m.
South Carolina.—Pacolett, 14th, 22d; Aiken and Stateburg, 22d.
Tennessee.—Chattanooga, 21st; Knoxville, 22d; Memphis and Milan, 28th, 30th.
Texas.—Clarksville, 4th, 26th; Galveston, 4th, 5th, 27th, 28th, 29th; Palestine, 4th, 10th, 11th, 26th, 28th, 29th, 30th; Fort Davis, 10th; Fort Concho, 10th, 11th, 30th; Indianola, 10th, 22d, 28th; Cleburne, 11th, 12th, 27th, 28th; Brownsville, 31st.
Virginia.—Dale Enterprise, 6th; Wytheville, 6th, 15th; Cape Henry, Chincoteague, and Fort Myer, 15th.
Washington Territory.—Port Angeles, 5th.
West Virginia.—Helvetia, 6th.

ELECTRICAL PHENOMENA.

The observer on the summit of Mount Washington, New Hampshire, reports the following:

"During the 19th everything on the summit was highly charged with electricity. A brass tube held against the stove discharged perceptible sparks; by touching the ears of the cat electric sparks were emitted, producing a snapping noise resembling that caused by lighting a match."

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories as follows:

Arkansas.—1st, 7th, 8th, 24th, 26th, 31st.
California.—14th, 15th.
Connecticut.—23d, 24th.
Dakota.—10th, 19th, 21st, 22d, 26th, 30th, 31st.
Delaware.—5th.
Florida.—1st, 4th, 6th, 8th, 12th, 16th.
Idaho.—10th, 11th, 31st.
Illinois.—22d.
Iowa.—4th, 8th, 9th, 16th, 18th, 22d, 24th, 31st.
Kansas.—1st, 8th, 24th, 30th, 31st.
Louisiana.—24th.
Michigan.—19th, 21st, 23d, 24th.
Minnesota.—15th, 22d, 24th, 31st.
Missouri.—31st.
Nebraska.—22d, 24th, 31st.
New York.—1st, 17th, 25th, 27th, 29th, 30th.
North Carolina.—12th, 14th, 22d, 23d.
Ohio.—1st.
Tennessee.—23d, 24th.
Texas.—12th, 15th, 30th, 31st.
Utah.—7th.
Virginia.—5th, 8th, 16th, 23d, 25th, 28th, 29th.
Wisconsin.—22d, 24th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories as follows:

Arizona.—7th, 24th, 25th.
Arkansas.—24th.
California.—24th, 25th, 29th, 30th.
Colorado.—2d.
Connecticut.—4th, 23d, 29th.
Dakota.—24th, 26th, 29th, 31st.
Delaware.—1st, 22d, 23d, 25th, 29th, 30th, 31st.
District of Columbia.—29th, 31st.
Florida.—2d, 3d, 7th, 25th, 30th.
Georgia.—1st, 4th, 5th, 31st.
Idaho.—1st, 31st.
Illinois.—3d, 8th, 25th.
Indiana.—4th, 5th, 28th.
Indian Territory.—24th, 26th, 28th to 31st.
Iowa.—4th, 5th, 9th, 24th, 31st.
Kansas.—1st, 3d, 10th, 23d to 26th, 30th.
Kentucky.—27th to 30th.
Louisiana.—25th, 29th, 30th.
Maine.—29th.
Maryland.—30th.
Massachusetts.—23d, 25th, 29th.
Michigan.—3d, 4th, 24th, 25th, 26th.
Minnesota.—4th, 23d, 25th, 26th, 29th, 30th.
Missouri.—9th, 31st.
Montana.—29th.
Nebraska.—3d, 4th, 5th, 8th, 10th, 30th.
Nevada.—1st, 30th.
New Hampshire.—25th, 29th.
New Jersey.—4th, 5th, 23d.
New Mexico.—3d.
New York.—1st, 4th, 6th, 23d, 25th, 27th to 31st.
North Carolina.—4th, 22d, 26th, 27th, 28th.
Ohio.—5th, 6th, 22d, 24th, 26th, 28th, 29th, 30th.
Oregon.—30th.
Pennsylvania.—23d, 27th, 30th, 31st.
Rhode Island.—23d, 29th.
Tennessee.—1st, 2d, 9th, 10th, 24th, 26th, 28th to 31st.
Texas.—1st, 2d, 7th, 12th, 24th, 25th, 26th, 28th, 30th.
Utah.—6th, 24th, 28th, 31st.
Vermont.—25th.
Virginia.—1st, 4th, 5th, 7th, 8th, 9th, 24th, 27th to 31st.
Washington Territory.—8th, 28th, 30th.
Wisconsin.—3d, 4th, 22d, 24th, 26th, 29th, 31st.
Wyoming.—6th, 25th, 26th.

The phases of the moon during December were: full moon, 2d, 1.53 p. m.; last quarter, 9th, 6.24 a. m.; new moon, 17th, 8.18 a. m.; first quarter, 25th, 8.15 a. m.; perigee, 2d, 10 p. m.; apogee, 16th, 11 p. m.

MIRAGE.

Delaware Breakwater, Delaware, 24th: Cape May was plainly visible all day, and appeared to be only a few miles distant. The images of vessels appeared doubly reflected, the first image being inverted and the second above the first in an upright position; all the images appeared much flattened and elongated; the horizon appeared much elevated and vessels at great distances were seen, all appearing with distinctness. An unusually high temperature for the season and a hazy atmosphere prevailed all day.

Fort Grant, Arizona, 3d: a beautiful mirage was observed this a. m. in the south. The shapes of the mountains were

distorted into a variety of forms, and a reflection of a cataract was visible for one hour.

Mirages were observed at other places as follows:

Webster, Dakota, 25th.

Salina, Kansas, 2d.

Genoa, Nebraska, 2d, 8th.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty stations show 4,943 observations to have been made, of which four were reported doubtful; of the remainder, 4,939, there were 4,193, or 84.9 per cent., followed by the expected weather.

SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for December, 1884:

Date—Dec., 1884.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 10 a. m.	1	15‡	0	0	1	1	4	40‡	
2, 10 a. m.	0	0	0	0	0	0	4	40‡	
3, 3 p. m.	0	0	1	5‡	0	0	3	35‡	
4, 9 a. m.	0	0	0	0	0	0	3	35‡	
5, 1 p. m.	1	5‡	0	0	1	1	4	40‡	
7, 10 a. m.	0	0	0	5‡	0	0	4	25‡	
14, 11 a. m.	.....	.....	.....	.....	.....	.....	4	10‡	
14, 2 p. m.	0	0	0	0	0	0	4	10‡	
16, 10 a. m.	2	5‡	0	0	1	1	6	15‡	Spots mostly small.
19, 10 a. m.	.....	.....	.....	.....	.....	.....	4	25‡	
20, 3 p. m.	1	20‡	0	0	1	10‡	5	45‡	
23, 8 a. m.	.....	.....	.....	.....	.....	.....	5	30‡	
25, 11 a. m.	1	3	0	0	1	3	6	35‡	
26, 4 p. m.	0	0	2	5‡	0	0	3	25‡	
29, 4 p. m.	0	0	.....	.....	0	0	3	15‡	
30, 4 p. m.	2	5‡	0	0	0	0	5	20‡	

Faculæ were seen at the time of every observation. ‡Approximated.

SUN GLOWS.

The sun glows continued during December, and were as extensively reported as in previous months.

The observer on the summit of Mount Washington, New Hampshire, reports the following: "At sunset on the evening of the 19th the western sky was beautifully tinged with a reddish purple color; the setting of the sun in a bank of cloud which was below the elevation of the summit made a rare and beautiful sight."

The observer at Point Judith, Rhode Island, reports that the sunset display on the 30th was the most brilliant observed since the autumn of 1883.

Many observers along the Atlantic coast report the display on the 6th as exceptionally brilliant.

EARTHQUAKES.

The following is from the "New York Maritime Register" of January 14, 1885:

The British bark "Helen Isabel," Olsen, from Cadiz, which arrived at Saint John's, Newfoundland, January 8, reported that on December 18, at 2 a. m, latitude 38° 51′ N., longitude 29° 55′ W., experienced terrific earthquake shocks lasting fifteen minutes. The ship was shaken in every fibre, and the crew, paralyzed with fear, broke through all discipline and cut the boats loose. The cessation of the shocks restored tranquility on board. The sea was calm and the weather fine at the time.

The British ship "Struan," which arrived at San Francisco January 2, from Panama, reports December 6, 11.30 p. m., latitude 4° 17′ N., longitude —° —′, experienced two distinct shocks of earthquake, the first lasting about thirty seconds, with an interval of twenty seconds, the other lasting about fifteen seconds, both of which shook the ship as though she were passing over a reef. The sea at the time was very smooth, with light breeze from sw.

The San Francisco "Evening Bulletin" of December 13, 1884, contains the following:

An examination of the tidal sheet from the self-registering tide-gauge of the United States Coast Survey at station Saucelito, clearly shows the record of a series of earthquake waves that entered the Golden Gate on the 12th of last November. They commenced at eight o'clock in the morning and ended at eleven. There are nine well marked crests in two and one-half hours, or only seventeen minutes apart. They are only two or three inches in height, but maintain the characteristic earthquake features in plain contrast with the breaking bar markings which are very sharp and frequent. It would appear from the height and length of the waves and its short variations that this submarine earthquake took place near our coast and was not violent.

LACONIA, N. H., *December* 17, 1884.—The heaviest earthquake shock ever experienced here occurred at about two o'clock this morning. It was felt in all the adjoining towns, but the heaviest jar was at Centre Harbor, lasting half a minute. The vibrations seemed to come from a northerly direction and to pass toward the south. Doors and dishes were shaken in many residences in this town.

The following is from the "New York Herald" of December 27, 1884:

MADRID, *December* 26, 1884.—An earthquake occurred here to-day. Two houses were slightly damaged. Some alarm was caused by the shock at the opera house and in the populous quarters of the city. The shocks were felt at Gibraltar, and were severe in the southern provinces. They caused great alarm among the people at Granada. At Malaga two persons were killed by falling walls.

Numerous towns are reported as having suffered from the earthquake. Several houses, including the telegraph station, at Velez Malaga were badly injured, and the terrified inhabitants encamped in the outskirts of the town during the night. Many persons were injured at Loja, Motril, and Alhama, and the convent at Seville was partly destroyed. The people were greatly alarmed.

An official in the Velez telegraph office was killed. It is reported that several other people were killed there. One person was killed and many were injured at Motril. The village of Albunuelas, in Granada, was nearly destroyed. Slight damage was done in cities of Seville and Granada.

The "New York Journal of Commerce" for December 30, 1884, contains the following:

MADRID, *December* 29.—According to the official news of the earthquake up to last midnight five hundred and twenty-six persons were killed in the Province of Granada and one hundred in Malaga. At Alhama over three hundred and fifty bodies have already been recovered. At Periana, a village in Andalusia, about thirty miles from Malaga, great damage was done, and many lives were lost. Sixty bodies have so far been recovered. Many persons died of fright.

A fatal land slip occurred in the mountains near Periana. This destroyed many houses which stood in its path and buried forty-eight persons. Of these eighteen were rescued alive.

It is reported that nine hundred persons were buried beneath the ruins of the buildings of Albunuelas. Three churches at Antiquera were left in a tottering condition. The inhabitants are encamped in the fields.

The telegraph lines in Andalusia were rendered useless in consequence of the earthquake. Advices received by mail show that the results in Malaga were even more terrible than heretofore reported. The loss in the town exceeds $500,000. Two hundred and twenty-seven houses were damaged.

Renewed shocks were felt in various places to-day. Further damage was done at Cordova, and the inhabitants are leaving the town in a panic.

VIENNA, AUSTRIA, *December* 28.—A severe earthquake shock was experienced in Carinthia to-day. Considerable damage was done to many buildings.

LONDON, *December* 29.—An earthquake was felt in Wales to-day. Many houses were injured.

The following is from the "Philadelphia Public Ledger" of January 1, 1885:

MADRID, *December* 31.—Further earthquake shocks were experienced yesterday at Velez Malaga, a city of 13,000 people, a few miles from Malaga. They were very violent, and many houses that had been previously damaged were utterly destroyed. The people were terror-stricken and have abandoned the city altogether. They are now encamped outside the town, and the telegraph station has been removed to the same place.

The shocks yesterday were also felt with more or less severity elsewhere throughout the province of Malaga and through Granada. They occurred between 7 and 10 a. m. There was further loss of life and property at Periana, Riogordo, Vinuela, and Alfanatejo.

A thousand houses at Alhama are in ruins. The work of searching the debris for the bodies of the victims was vigorously prosecuted yesterday, and one hundred and ninety-two bodies were recovered.

It is estimated that the total number of persons who have been killed since Christmas is 2,000. The town of Albuqueros was completely destroyed. Many persons perished, among whom were several local officials.

Subscriptions for the relief of the sufferers have been started at Madrid, Malaga, and Granada. The king has subscribed $6,000.

The panic caused by the recent earthquakes is increasing at Archidona, Granada, Torrex, and Velez Malaga. The inhabitants are still encamped

in the fields. The museum, university, hospital, prison, and government offices at Granada were more or less severely damaged.

The shocks yesterday in Granada and Malaga were very disastrous, and were attended with heavy mortality.

The following is an extract from the log of the British s. s. "Glenrath," J. T. Henderson commanding:

On December 25th experienced an earthquake shock at 9. 30 p. m., while in Malaga harbor, Spain. At 8 a. m. the barometer read 30.30; it fell gradually until 9.30 p. m., when it read 29.60. The temperature during the day averaged 64°, and the direction of the wind previous to the shock was ssw., very light—almost a calm. A few minutes after the shock very heavy rain fell, which continued throughout the night and until 10 a. m. on the following day, when the weather cleared. The shock made the vessel tremble violently.

METEORS.

Gardiner, Maine: a brilliant meteor was observed at 11 p. m. on the 9th, which lighted up the sky as if by an electric light. It was seen by several persons in different localities. At Rockland, forty miles distant, it was reported to have resembled a rocket; before disappearing it exploded into several fragments.

The following extract is from the "New York Herald" of December 17th 1884:

QUEBEC, P. Q. *December* 16, 1884.—An aerolite fell on the farm of C. Francois, at Chateau Richer, below Montmorency Falls, a short distance from Quebec, at three o'clock Saturday (13th) morning. It was dug up from the ground, in which it had imbedded itself, and was found to measure about a foot in diameter. The people at Chateau Richer were so startled by the intense light that many rushed out of their houses to ascertain its cause. They say that the falling meteor presented the appearance of a huge ball of fire, which lighted up the whole countryside almost with the brilliancy of the noonday sun.

Wauseon, Fulton county, Ohio: a meteor was observed at 10 p. m. on the 20th moving across the sky from southwest to northeast; the weather was cloudy at the time and the meteor produced a light as bright as that of the full moon. An observer reports that after the flight of the meteor a hissing noise was heard.

Sycamore, De Kalb county, Illinois: a flash of light, supposed to have been due to the passage of a meteor, was observed at 10 p. m. on the 20th; the phenomenon was observed by several persons, who did not see the meteor or any trail to indicate its course, but the light is reported to have been very brilliant.

Mottville, Saint Joseph county, Michigan: a large and brilliant meteor passed across the southwestern sky at 9.30 p. m. on the 20th, producing a light resembling a flash of lightning. At its disappearance at the horizon, a low rumbling sound like distant thunder was heard.

Meteors were also observed at the following places:
Knoxville, Tennessee, 7th.
Indianapolis, Indiana, 7th.
Archer, Florida, 9th, 11th, 14th.
Vevay, Indiana, 26th.
Cedar Rapids, Iowa, 8th.
Richmond, Kentucky, 18th.
Woodstock, Maryland, 3d, 5th, 7th, 9th, 15th.
Rowe, Massachusetts, 5th, 23d.
Taunton, Massachusetts, 9th.
Hillsdale, Michigan, 19th.
Le Roy, New York, 12th.
Brevard, North Carolina, 22d.
Jacksonburg, Ohio, 4th.
Stateburg, South Carolina, 9th, 11th, 13th.
Wytheville, Virginia, 10th.
Dale Enterprise, Virginia, 16th, 28th.
Dyberry, Pennsylvania, 29th.

POLAR BANDS.

Archer, Florida, 2d, 3d, 21st.
Maud, Kansas, 12th, 18th, 22d.
Yates Centre, Kansas, 15th, 25th.
Gardiner, Maine, 4th, 5th.
Escanaba, Michigan, 21st.
Kitty Hawk, North Carolina, 31st.
Wauseon, Ohio, 3d.
Nashville, Tennessee, 10th, 16th, 19th, 23d, 24th.
Rio Grande City, Texas, 12th, 22d, 29th, 30th.
El Paso, Texas, 6th, 15th, 16th, 24th, 25th.
Wytheville, Virginia, 5th, 19th, 23d.

WATER-SPOUT.

The s. s. "North Anglia," C. N. Mumford, commanding, in N. 35° 2′, W. 74° 30′, passed a water-spout bearing southwest, at 4 p. m., on the 19th.

MIGRATION OF BIRDS.

***Geese flying southward.*—Lewiston, Idaho, 13th; Independence, Kansas, 25th; Holton, Kansas, 7th; Eastport, Maine, 12th; Somerset, Massachusetts, 11th, 12th, 13th, 17th, 18th, 24th, 30th; Block Island, Rhode Island, 3d, 9th, 16th; Point Judith, Rhode Island, 7th, 8th, 9th, 13th, 15th, 16th, 17th, 25th, 30th.**
***Ducks flying southward.*—Memphis, Tennessee, 24th.**
***Geese flying northward.*—Augusta, Georgia, 16th.**
***Ducks flying northward.*—Indianola, Texas, 19th.**

DROUGHT.

Norfolk, Virginia: the drought which has prevailed during the past four months was terminated by the rains of the 6th.

PRAIRIE FIRES.

Yankton, Dakota, 2d, 3d.
Pike's Peak, Colorado, 3d, east of station.

NOTES AND EXTRACTS.

The following is an extract from the December report of the Ohio Meteorological Bureau:

Atmospheric pressure.—Highest barometer, 30.72, at Wauseon, Fulton county, on the 19th; lowest barometer, 29.23, at Portsmouth, Scioto county, on the 6th; highest monthly barometric mean, 30.20, at Dayton, Montgomery county; lowest monthly barometric mean, 29.96, at Portsmouth, Scioto county; mean barometer for the state (from twenty-one stations) 30.15.

Temperature.—Highest, 69°, at Ironton, Lawrence county, on the 4th; lowest, —32°.4, at Wauseon, Fulton county, on the 19th; highest monthly mean, 34°.0, at Marieta, Washington county; lowest monthly mean, 24°.5, at Wauseon; mean for the state (thirty-two stations reporting) 30°.2.

Precipitation.—Average for the state, 3.69; station reporting largest, 5.03, Sidney, Shelby county; station reporting smallest, 1.83, Cleveland.

Winds.—Prevailing direction, southwest.

Prof. H. A. Huston, of Lafayette, Indiana, furnishes the following meteorological summary for the state, with the accompanying remarks:

Districts.	Temperature.			Precipitation.
	Highest.	Lowest.	Monthly mean.	
	°	°	°	
Northern counties	56	—16	25.7	5.63
Central counties	62	—31	27.9	6.03
Southern counties	65	— 9	31.2	6.34
State	62	—31	28.3	6.00

The mean temperature of the state was 5°.48 above that of last year; it was 4°.86 above the mean at Indianapolis for thirteen years and 1°.24 above the mean for five years at Lafayette.

The rainfall for the state, 6.00 inches, was 2.06 inches above that of last year; it was 2.39 inches above the mean for thirteen years at Indianapolis, and 2.62 inches above the mean of five years at Lafayette.

The lowest temperature was during the cold wave of the 18th and 19th, Lafayette and Earl Park, both report a minimum of —31°.

The snowfall for the state 9.89 inches is 1.3 inches below that of last year.

Rivers rose rapidly after the storm of the 27th and 28th, but little damage was reported.

The following is an extract from the December report of the Louisiana Weather Service, under direction of Mr. Robert S. Day, New Orleans:

Temperature.—Mean for December, 1884, 54°.1; highest, Franklin, 7th, 84°.0; lowest, Lake Providence, 26th, 12°.0; greatest daily range, Lake Providence, 21st, 47°.0; least daily range, Vidalia, 19th, 2°.0.

Precipitation.—Average rainfall, 10.05 inches; greatest daily rainfall, 7.00 inches, Lake Providence, 29th; greatest rainfall for month, 18.53 inches, Monroe; average rainy days, 10.5.

Meteorological record of voluntary observers and army post surgeons—December, 1884.

Station.	Temperature Mean.	Maximum.	Minimum.	Rainfall.
Orono, Me	23.6	50	—20	4.74
Cornish, Me	.....	54	—18	5.92
Gardiner, Me	26.8	59	—13	5.95
Autrim, N. H	.....	.....	.....	5.10
Contoocook, N. H	27.9	58	—17	4.50
Weir's Bridge, N. H	.....	.....	.....	3.67
Lake Village, N. H	.....	.....	.....	4.12
Bristol, N. H	.....	.....	.....	5.05
Ashland, N. H	.....	.....	.....	5.10
Woodstock, N. H	.....	.....	.....	4.05
Belmont, N. H	.....	.....	.....	4.22
Wolfborough, N. H	.....	.....	.....	5.05
Charlotte, Vt	23.8	52	—16	4.50
Burlington, Vt	20.8	54	—17	2.00
Woodstock, Vt	21.8	52	—32	4.09
Dorset, Vt	25.6	56	—20	4.03
Lunenburg, Vt	21.6	50	—26	0.70
Newport, Vt	21.9	50	—23	3.21
Strafford, Vt	23.0	50	—24	3.80
Williamstown, Mass	27.9	58	—20	3.72
Mendon, Mass	30.0	57	—10	.....
Milton, Mass	33.0	60	—12	4.27
New Bedford, Mass	33.4	55	—10	5.97
Somerset, Mass	33.3	58	—14	5.07
Princeton, Mass	27.7	54	—18	9.59
Westborough, Mass	33.0	61	—12	5.49
Taunton, Mass	34.0	63	—10	5.31
Deerfield, Mass	25.7	59	—16	.....
Rowe, Mass	20.2	57	—19	5.03
Fall River, Mass	33.0	58	—10	6.94
Worcester, Mass	28.9	56	—13	5.75
Providence, R. I	34.1	62	—12	0.59
Nayatt Point, R. I	.....	66	—10	7.03
Hartford, Conn	30.0	59	—12	6.09
Southington, Conn	29.4	51	—13	6.45
North Colebrook, Conn	27.3	57	—20	5.30
Bethel, Conn	.....	.....	—10	6.52
Voluntown, Conn	.....	62	—12	8.00
Fort Hamilton, N. Y	34.4	60	— 1	5.40
Mountainville, N. Y	29.5	62	—14	5.23
Palermo, N. Y	33.5	53	—19	3.42
Auburn, N. Y	30.7	58	—17	2.41
Humphrey, N. Y	24.2	58	—13	3.09
Menand, N. Y	27.5	53	—20	3.13
Ithaca, N. Y	29.2	58	—20	2.42
Le Roy, N. Y	28.1	63	— 3	2.18
Penn Yan, N. Y	.....	.....	.....	1.99
Cooperstown, N. Y	27.0	56	—22	4.00
North Volney, N. Y	20.5	57	—15	3.50
Port Jervis, N. Y	28.0	56	— 7	4.23
Factoryville, N. Y	28.2	58	—12	2.73
White Plains, N. Y	34.3	59	— 6	5.95
Fort Niagara, N. Y	29.5	54	0	1.70
Fort Columbus, N. Y	33.8	66	3	6.44
West Point, N. Y	31.9	64	—12	6.20
Madison Barracks, N. Y	24.9	57	—29	2.68
Plattsburg Barracks, N.Y.	22.0	53	—19	1.26
David's Island, N. Y	35.4	62	— 7	8.75
Phillipsburg, N. J	32.4	64	2	4.59
Somerville, N. J	32.4	60	— 7	5.78
Readington, N. J	38.0	66	2	7.00
Vineland, N. J	37.7	64	— 4	0.53
Moorestown, N. J	33.0	64	— 2	5.37
South Orange, N. J	33.0	60	0	5.40
Salem, N. J	30.8	65	5	.....
Paterson, N. J	31.0	59	— 2	5.95
Wellsborough, Pa	30.0	60	—12	0.39
Fallsington, Pa	32.9	62	0	6.00
Leetsdale, Pa	29.5	62	— 6	4.84
Grampian Hills, Pa	25.6	58	—12	3.65
Drifton, Pa	30.5	62	— 8	4.70
Troy, Pa	26.0	56	—15	3.28
Easton (Lafayette Col.), Pa	.....	.....	.....	0.07
Dyberry, Pa	27.5	56	—15	3.74
Blooming Grove, Pa	29.8	62	0	3.40
Catawissa, Pa	31.8	65	— 2	3.77
Westchester, Pa	32.9	62	— 1	7.00
Easton, Pa	34.3	70	4	.....
Quakertown, Pa	30.4	52	0	6.46
Altoona, Pa	33.0	60	0	3.39
Tamaqua, Pa	31.0	56	— 4	7.40
Chambersburg, Pa	31.5	60	3	4.83
Franklin, Pa	25.2	53	—12	3.72
Haverford College, Pa	.....	63	— 1	5.32
State College, Pa	.....	58	— 5	2.17
Cumberland, Md	33.2	56	— 4	4.25
McDonogh School, Md	33.9	62	— 1	3.81
Emmittsburg, Md	32.8	60	4	4.00
Woodstock, Md	33.7	61	— 8	2.15
Fallston, Md	34.0	61	0	6.00
Great Falls, Md	30.8	68	11	4.16
Fort McHenry, Md	33.9	62	4	3.90
Dale Enterprise, Va	34.2	68	— 2	5.04
Wytheville, Va	38.3	67	0	3.02
Variety Mills, Va	38.1	67	— 4	4.74
Accotink, Va	38.9	68	6	3.53
Blacksburg, Va	.....	64	— 4	2.19
Fort Monroe, Va	42.9	69	9	3.02
Snowville, Va	.....	70	— 2	.....
Marion, Va	35.6	66	— 2	4.60
Summit, Va	36.4	68	4	.....
Johnsonton, Va	44.1	70	12	4.90
Kelleys, N. C	45.9	74	8	9.40
Asheville, N. C	41.0	68	5	2.90
Lenoir, N. C	.....	64	10	8.10
Brevard, N. C	42.9	66	10	10.25
Lincolnton, N. C	37.4	.....	.....	9.32
Statesville, N. C	43.8	72	10	5.35
Weldon, N. C	41.6	70	8	5.99
Chapel Hill, N. C	43.2	78	7	6.98
Stateburg, S. C	42.5	68	17	5.87
Aiken, S. C	48.0	72	17	6.02
Pacolett, S. C	42.6	66	15	6.60
Milledgeville, Ga	48.8	71	18	5.87
Forsyth, Ga	49.3	73	16	4.73
Quitman, Ga	.....	74	28	6.60
Manatee, Fla	69.8	86	42	2.00
Archer, Fla	63.1	78	31	3.75
Mayport, Fla	62.1	80	40	2.95
Tallahassee, Fla	49.0	76	22	.....
Newport, Fla	57.3	74	27	10.99
Limona, Fla	65.9	84	34	0.80
Saint Augustine, Fla	60.9	80	35	1.87
Green Springs, Ala	48.7	72	12	5.39
Greensboro, Ala	49.7	75	16	6.09
Mt. Vernon B'k's, Ala	54.8	80	15	3.10
Birmingham, Ala	.....	.....	10	.....
Point Pleasant, La	48.9	71	17	20.39
Liberty Hill, La	.....	70	29	.....
Luling, La	.....	81	25	6.13
Grand Coteau, La	57.7	75	25	14.43
Cleburne, Tex	38.2	76	8	4.01
Fort Brown	60.7	83	29	0.80
Clarksville, Tex	41.8	72	10	7.48
Fort Concho, Tex	42.7	83	10	5.85
Austin, Tex	49.5	74	27	1.68
Mount Ida, Ark	38.2	70	15	15.95
Lead Hill, Ark	29.1	67	4	11.37
Helvetia, W. Va	35.8	65	— 0	4.30
Milan, Tenn	37.4	65	3	7.25
Austin, Tenn	41.5	68	3	3.34
Ashwood, Tenn	40.0	64	3	3.70
Greenville, Tenn	42.0	69	10	2.50
Maryville, Tenn	41.0	70	9	6.00
Andersonville, Tenn	40.0	67	9	3.33
Careyville, Tenn	38.0	66	6	6.21
Parksville, Tenn	42.0	70	9	6.71
Sunbright, Tenn	38.0	66	0	2.19
Grief, Tenn	40.0	70	7	6.49
Farmingdale, Tenn	.....	.....	.....	5.73
Fostoria, Tenn	38.0	62	4	7.20
Grassy Cove, Tenn	36.0	60	6	4.15
Cookeville, Tenn	.....	.....	.....	4.98
McMinnville, Tenn	38.0	65	4	5.25
Manchester, Tenn	38.6	67	4	7.16
Riddleton, Tenn	40.0	72	4	4.85
Beech Grove, Tenn	39.0	64	4	4.85
Flat Creek, Tenn	40.0	63	6	7.04
Florence Station, Tenn	40.0	65	6	3.79
Howell, Tenn	40.0	65	5	6.19
Hardison's Mills, Tenn	40.0	63	2	4.69
Hurricane Switch, Tenn	41.0	61	3	4.22
Pulaski, Tenn	41.0	66	4	4.78
Dickson, Tenn	.....	.....	.....	4.08
Kingston Springs, Tenn	39.0	66	2	3.90
Sailors Rest, Tenn	36.0	59	10	2.77
Waynesboro, Tenn	39.0	60	4	4.22
Savannah, Tenn	41.0	64	5	4.36
McKenzie, Tenn	36.0	63	2	5.66
Henderson, Tenn	.....	.....	.....	5.36
Milan, Tenn	37.0	65	3	7.25
Trenton, Tenn	37.0	63	2	7.14
Bolivar, Tenn	39.0	64	6	5.81
Dyersburg, Tenn	35.0	68	— 1	8.85
Somerville, Tenn	40.0	66	8	7.91
Covington, Tenn	32.0	65	9	4.56
Richmond, Ky	36.1	60	— 8	2.76
Frankfort, Ky	35.3	65	— 6	4.16
Ruggles, Ohio	28.5	58	—14	2.15
Hiram, Ohio	28.2	59	— 4	3.49
New Athens, Ohio	30.0	59	— 9	4.42
Cleveland, Ohio	30.9	60	— 4	2.82
Westerville, Ohio	29.3	59	—22	2.83
North Lewisburg, Ohio	29.9	59	—20	4.40
College Hill, Ohio	31.8	60	— 6	4.12
Jacksonborough, Ohio	27.4	58	— 8	3.40
Margaretta, Ohio	.....	61	—15	2.85
Wauseon, Ohio	24.5	56	—32	3.38
Portsmouth, Ohio	33.9	54	— 6	4.70
Garrettsville, Ohio	28.8	63	— 8	2.99
Lafayette, Ind	25.8	58	—31	6.27
Fort Wayne, Ind	29.0	58	—13	4.95
Logansport, Ind	26.8	62	—15	5.82
Angola, Ind	.....	48	—20	5.11
Laconia, Ind	33.6	63	— 9	4.48
Terre Haute, Ind	29.6	58	— 9	5.50
Sunman, Ind	30.3	60	— 6	3.38
Jeffersonville, Ind	34.2	62	— 8	4.72
Spiceland, Ind	27.2	59	—17	6.47
Vevay, Ind	34.0	66	— 6	3.83
Wabash, Ind	26.0	56	—15	5.54
Monticello, Ind	26.4	59	—18	5.92
Frankfort, Ind	25.8	57	—13	2.48
Attica, Ind	24.0	58	—18	.....
Connersville, Ind	28.8	60	—11	6.40
Noblesville, Ind	29.1	55	—16	4.74
Greenfield, Ind	26.6	58	—11	.....
Franklin, Ind	30.8	58	—10	2.70
Fillmore, Ind	25.0	53	—10	7.04
Farmland, Ind	28.1	60	—20	6.19
Mauzy, Ind	20.1	60	—17	6.14
Romney, Ind	25.5	62	—27	4.68
Dana, Ind	26.4	57	—15	4.80
Richmond, Ind	27.9	57	—15	5.80
Columbus, Ind	30.2	64	— 9	5.01
Blue Lick, Ind	32.5	61	— 9	5.56
Marengo, Ind	35.5	64	— 2	7.65
Huntingburg, Ind	31.4	62	— 6	6.66
Princeton, Ind	31.4	63	— 6	7.70
Worthington, Ind	31.9	60	— 9	7.26
Degonia Springs, Ind	33.1	65	— 4	6.52
Salem, Ind	31.9	62	— 5	4.98
Corydon, Ind	37.8	62	— 5	6.85
Bloomington, Ind	31.9	64	—12	3.49
Tipton, Ind	27.1	53	—12	.....
McLeansboro', Ill	31.8	62	— 8	8.24
Mattoon, Ill	28.5	64	—13	5.45
Aurora, Ill	23.5	55	—21	4.57
Sycamore, Ill	20.5	51	—16	4.14
Prairieville, Ill	20.8	50	—20	5.56
Sandwick, Ill	21.6	54	—20	5.23
Griggsville, Ill	21.0	57	—13	3.43
Wilton Centre, Ill	25.7	55	—24	4.84
Collinsville, Ill	29.2	62	—10	5.68
Peoria, Ill	27.3	57	—10	3.21
Pana, Ill	.....	66	—11	4.88
Anna, Ill	32.5	67	— 7	9.57
Swanwick, Ill	29.3	60	— 8	5.78
Bunker Hill, Ill	21.7	63	—13	5.80
Palestine, Ill	29.2	60	— 9	5.84
Rockford, Ill	21.4	47	—19	6.51
Greenville, Ill	29.3	62	—10	7.02
Riley, Ill	19.4	51	—21	3.28
Centralia, Ill	30.0	60	—10	5.50
Hudson, Mich	24.3	53	—28	2.33
Hillsdale, Mich	.....	54	—19	4.14
Manistique, Mich	21.6	48	—19	5.05
Ionia, Mich	24.7	52	—24	5.25
Northport, Mich	.....	48	27	2.00
Traverse City, Mich	.....	47	—11	5.70
Kalamazoo, Mich	.....	49	— 9	7.14
Thornville, Mich	27.4	53	—14	3.07
Boyne, Mich	23.6	51	—17	6.52
Lansing, Mich	20.0	55	—22	2.77
Mottville, Mich	.....	52	—17	.....
Moorestown, Mich	24.2	51	—23	2.80
Embarras, Wis	17.4	46	—30	5.51
Sussex, Wis	17.9	44	—25	4.75
Wausau, Wis	14.1	41	—30	3.70
Beloit, Wis	18.7	52	—19	4.24
Neillsville, Wis	6.9	37	—38	0.90
Lancaster, Wis	.....	45	—30	4.02
Madison, Wis	16.8	43	—20	5.68
Manitowoc, Wis	22.3	47	— 2	5.36
Prairie du Chien, Wis	20.6	46	—24	2.79
Franklin, Wis	.....	.....	.....	2 25
Minneapolis, Minn	8.6	46	—32	2.31
Northfield, Minn	10.1	45	—38	2.33
Fort Snelling, Minn	8.9	46	—37	1.41
Chester, Minn	.....	41	—36	0.95
Monticello, Iowa	15 8	48	—24	4.34
Des Moines (near) Iowa	16.4	53	—23	.....
Indianola, Iowa	18.0	53	—16	2.29
Independence, Iowa	15.4	43	—22	2.04
Ottumwa, Iowa	18.9	50	—18	3.12
Manchester, Iowa	17.0	50	—21	2.57
Logan, Iowa	17.1	54	—24	1.10
Oskaloosa, Iowa	.....	52	—20	.....
Cedar Rapids, Iowa	16.0	50	—32	3.54
Fort Madison, Iowa	.....	50	—12	3.10
Guttenberg, Iowa	15.2	44	—24	2.60
Muscatine, Iowa	16.3	54	—19	4.42
West Union, Iowa	13.8	41	—25	2.47
Humboldt, Iowa	3.6	48	—29	2.50
Maynard, Iowa	18.7	46	—30	.....
Mount Vernon, Iowa	17.2	48	—24	.....
Cedar Rapids, Iowa	20.1	49	—22	3.01
De Soto, Nebr	14.7	50	—19	1.20
Fremont, Nebr	12.8	55	—24	2.01
Red Willow, Nebr	19.0	69	—14	1.17
Genoa, Nebr	12.0	62	—24	1.65
Tecumseh, Nebr	19.7	62	—14	0.60
Crete, Nebr	14.1	.....	.....	0.19
Marquette, Nebr	19.5	57	—14	0.60
Falls City, Nebr	21.1	.....	.....	0.68
Syracuse, Nebr	19.0	.....	.....	0.65
Weeping Water, Nebr	14.6	.....	.....	0.75
Central City, Nebr	12.8	.....	.....	.....
DeWitt, Nebr	18.0	.....	.....	1.00
Nebraska City, Nebr	15.4	.....	.....	0.62
Stromsburg, Nebr	13.5	.....	.....	0.46
Madison, Nebr	15.0	64	—22	0.66
Table Rock, Nebr	19.4	.....	.....	0.44
West Hill, Nebr	9.9	.....	.....	1.85
Superior, Nebr	21.5	.....	.....	.....
West Point, Nebr	12.9	.....	.....	1.25
Greenfield, Mo	29.0	68	2	3.80
Springfield, Mo	31.8	63	— 5	7.62
Pierce City, Mo	29.0	68	— 1	10.10
Centreville, Mo	.....	62	—14	7.22
Conception, Mo	18.2	53	—13	1.46
Chamois, Mo	30.2	66	— 4	4.37
Carthage, Mo	30.0	67	— 5	6.91
Glasgow, Mo	26.0	61	— 5	3.37
Harrisonville, Mo	29.8	68	2	3.74
Ironton, Mo	31.6	58	— 6	7.47
Mascoutah, Ill	30.8	62	— 8	5.34
Kirksville, Mo	21.5	60	—12	2.53
Louisiana, Mo	24.6	60	—10	3.20
Mexico, Mo	.....	60	— 6	4.01
Miami, Mo	24.9	66	— 6	3.68
Oregon, Mo	20.3	59	—14	1.60
Pleasant Hill, Mo	.....	60	— 6	1.92
Steelville, Mo	.....	69	— 7	5.45
Sedalia, Mo	.....	71	— 8	4.77
Phelps City, Mo	19.6	53	—10	0.80
Saint Charles, Mo	.....	.....	.....	3.70
Protem, Mo	29.0	67	4	11.37
Atchison, Kans	22.2	60	— 8	0.90
Independence, Kans	25.4	64	— 3	3.34
Wyandotte, Kans	31.5	60	— 3	1.54
Yates Centre, Kans	22.8	64	— 7	2.26
Emporia, Kans	22.4	61	—10	1.81
Clay Centre, Kans	21.5	62	— 9	1.12
W. Leavenworth, Kans	.....	59	— 3	1.93
Elk Falls, Kans	.....	.....	.....	4.02
Maud, Kans	20.4	60	—12	0.80
Wellington, Kans	23.1	60	— 7	3.14
Allison, Kans	16.9	69	—22	0.80
Sterling, Kans	19.1	62	—10	1.16
Lawrence, Kans	23.5	60	— 6	2.56
Topeka, Kans	23.3	62	— 6	1.62
Sherlock, Kans	15.9	70	—16	1.38
Holton, Kans	21.0	62	—10	1.50
Richardton, Dak	3.2	41	—36	1.50
Fort Yates, Dak	5.2	52	—37	0.50
Fort Buford, Dak	0.3	58	—43	2.04
Fort Totten, Dak	6.3	45	—40	0.63
Fort Sisseton, Dak	3.2	42	—38	1.31
Fort Sully, Dak	8.7	59	—37	0.63
Fort Randall, Dak	11.6	58	—31	1.08
Fort Meade, Dak	6.5	73	—32	0.90
Fort A. Lincoln, Dak	1.7	48	—43	1.60
Webster, Dak	9.1	61	—36	1.52
Vermillion, Dak	.....	60	—30	0.70
Fort Collins, Colo	.....	67	—11	0 35
Pueblo, Colo	22.1	60	—15	0.78
Fort Lewis, Colo	25.6	53	—13	4.30
Fort Lyon, Colo	20.4	70	—21	.....
Tucson, Ariz	.....	.....	.....	4.72
Fort Keogh, Mont	5.3	55	—48	0.24
Fort Ellis, Mont	3.8	60	—36	1.80
Fort Assinaboine, Mont	2.8	65	—50	0.78
Fort Fred Steele, Wyo	19.1	55	—24	1.10
Fort Bridger, Wyo	25.6	60	— 9	0.25
Fort Union, N. Mex	33.5	67	—10	.....
Fort Wingate, N. Mex	30.0	.....	— 4	0.74
Nephi, Utah	30.7	50	— 7	5.40
Carson City, Nev	35.6	64	4	4.75
Fort McDermitt, Nev	29.1	55	— 2	1.88
Fall Brook, Cal	50.4	78	34	7.15
Poway, Cal	50.0	78	30	5.91
Princeton, Cal	50.0	68	24	6.03
Salinas, Cal	47.6	66	26	4.46
Oakland, Cal	51.2	93	30	7.73
Sacramento, Cal	45.9	65	23	8.89
Alcatraz Island, Cal	51.5	65	38	4.50
Angel Island, Cal	52.2	72	32	7.85
Benicia Barracks, Cal	50.2	84	32	7.19
San Raphael (near), Cal	.....	70	20	20.96
Fort Bidwell, Cal	30.3	58	2	6.36
Fort Gaston, Cal	41.7	93	16	14.49
Fort Mason, Cal	51.8	63	40	5.80
Eola, Oreg	30.7	49	8	6.09
Albany, Oreg	32.1	58	6	7.83
East Portland, Oreg	.....	54	8	2.97
Fort Klamath, Oreg	27.9	54	—15	8.68
Fort Townsend, Wash. T.	33.0	55	11	1.57

Frosts.—Delta, 1st, 2d, 19th, 25th, 26th; Mandeville, 19th; Clinton, 1st, 2d, 9th, 15th; Donaldsonville, 9th, 14th, 19th; Thibodaux, 19th; Alexandria, 18th, 19th; Lafayette, 1st, 19th; Franklin, 19th; Whiteville, 1st, 19th; Houma, 19th; Baton Rouge, 1st; Lake Providence, 1st, 2d, 18th, 19th. 23d, 24th, 25th, 26th; Cheneyville, 1st, 2d, 19th, 26th; St. Joseph, 1st, 18th, 19th, 26th; Monroe, 1st, 2d, 3d, 15th, 18th, 19th; Point-a-la-hache, 18th; Vidalia, 18th, 25th.

General notes.—Waves of low pressure existed in the state on the 3d and 4th, 5th and 6th, 11th and 12th, 20th and 21st, and 28th to 30th, each accompanied with excessive rainfall, that of the 29th and 30th being very heavy. Intervening cold waves of greater or less severity came from the northwest, that of the 19th being the coldest throughout the state. In brief, the month was a fair sample of our worst December weather, with immense range from heat to cold in a few hours. The heavy rains have filled the water courses and lowlands earlier than usual.

The temperature at New Orleans was about the average, while the rainfall was above it. The rains are now making up their shortage for months past.

The attention of those interested in meteorology is called to the Signal Service display in the Main Building at the Exposition, which will repay a visit.

The following is an extract from the December, 1884, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., of Auburn:

The month of December possessed no features of unusual interest. From the 1st to the 12th the temperature was moderate, with a few frosts, and some showery days; winds variable. In north Alabama the warmest period of the month was from the 6th to the 12th. The first cold wave warning received on the 12th was justified by a fall of twenty or thirty degrees on the 13th. This sudden fall was preceded in a few localities by high winds of tornadic violence, accompanied by thunder and lightning. From the 13th to the 17th the temperature was variable, with winds shifting from northwest to east, and some heavy rains. The second cold wave warning was telegraphed on the 17th; and the 18th and 19th were the coldest days of the month throughout the state, with a fall of thirty to forty-five degrees. At this period a slight fall of snow was general over middle and north Alabama. The wind then changed from northwest to southwest, and the temperature rose rapidly until the 22d. This was the day of greatest warmth in middle and southern Alabama. The third cold wave warning received on the 22d was followed by a reduction of temperature of from fifteen to thirty degrees. On the 26th the temperature rose again, and the remaining days of the month were mild, cloudy, and showery, with winds from the east and southeast.

There were six days without rain.

The precipitation was 5.61 inches, about one inch above the normal.

The temperature was 48.3 degrees.

The rainfall for Union Springs for the past year was 41.40 inches; two inches below the average (43 inches) for that place, and seventeen inches below the average (58 inches) for the state.

The rainfall for Auburn during the last year was 50.52 inches, about eight inches below the average for the state.

State summary.

Mean temperature, 48°; highest temperature, 80° at Newton on the 22d; lowest temperature, 6° at Gadsden on the 19th; range of temperature, 74°; greatest monthly ranges of temperature, 62° at Mt. Willing and Gadsden; 64° at Calera; least monthly ranges of temperature, 46° at Clanton; 56° at Chattanooga; greatest daily ranges of temperature, 45° at Tuscaloosa on the 19th; 64° at Calera on the 22d; least daily ranges of temperature, 0° at Wetumpka and Clanton on the 31st; 5° at Birmingham on the 5th.

Mean depth of rainfall, 5.61 inches; mean daily rainfall, 0.18 inch; greatest depth of monthly rainfall, 8.94 inches at Prattville; least depth of monthly rainfall, 2.99 inches at Union Springs; greatest daily rainfall, average for the state, 1.86 inches on the 14th; greatest daily rainfall, 3.50 inches at Prattville, and 3.40 inches at Tuscaloosa on the 14th.

Days of general rainfall, 14th, 21st; average number of days on which rain fell, 10; average number of cloudy days, 18; average number of fair days, 8; average number of clear days, 5.

Warmest day, 22d; coldest day 19th.

Prevailing direction of wind, southeast.

Thunder-storms were reported from Auburn on the 12th, 14th, 21st, and 22d; Birmingham, Carrollton, Florence, and Tuscumbia on the 21st; Greensboro on the 20th; Summerville on the 14th and 21st.

Frost was reported from most stations on the 1st, 3d, 8th, 9th, 10th, 16th, and 19th.

A slight fall of snow reported from all quarters in north Alabama on the 18th.

Ice was generally reported on the 1st, 3d, 16th, 18th, 19th, 20th, 23d, 24th, 25th, and 26th. At Greensboro, on the 19th, the ice was an inch and a half thick; and at Tuscumbia it was thick enough for skating.

The following is an extract from the December, 1884, report of the "Missouri Weather Service," under the direction of Prof. Francis E. Nipher, Saint Louis:

The mean temperature at the central station has been 29°.8, which is 3°.6 below the normal temperature for December at Saint Louis. December is colder than it has been during the past month about one year out of four. The mean of December fell as low as 23°.3 in 1872 and 1876.

The extremes of temperature during last month were *minus* 10° and 63°, which are not quite unusual, as temperatures as low have been observed in December seven times before. In 1872 (December 24) Engelmann recorded a temperature of —19°.5, and in 1880 one of —18.

During the last ten years some of our coldest as well as some of our warmest Decembers have occurred. For instance, in 1876 the mean fell to 23°.2, while in the next year it rose to 46°.5. The rain (and melted snow) has been 6.63 inches, the normal precipitation being 3.00. The fall of the past month has been exceeded but twice since 1839, viz.: in 1858, when the rainfall was 8.58 inches, and in 1849, when it was 10.90 inches.

In the state the lowest temperature reported is —16°, at Phelps City, which station also reports the lowest mean, 19°.6.

The rainfall varies quite uniformly from 0.8 in the extreme northwest part of the state to 9.0 in the southeast.

The snowfall of the month has been 14 inches at the central station, increasing to 16 inches at Louisiana and 17 inches at Mexico, where the maximum fall is reported. To the northward and westward the fall diminishes to 3 inches at Kirksville, 6.5 at Glasgow, 7 at Miami, 7 5 at Oregon, and to to the southward, 12 at Chamois, 7 at Centreville, and 3 at Greenfield. At the close of the month the northern part of the state had a snow cover of from 0.5 to 1 inch, the snow line passing from a point somewhat south of Kansas City eastward along the Missouri river to near Washington, and thence northwardly to Hannibal.

Mr. Wm. Kaucher, of Oregon, gives the mean annual temperature of that place for the twenty-nine years ending with 1884 as 51°.43. During that time the total rain (and melted snow) was 89.4 feet, with a mean annual fall of 37.03 inches. The total snowfall was 90.6 feet, being an annual fall of 37 53 inches.

The following is the bulletin for December, 1884, of the "Iowa Weather Service," under the direction of Dr. Gustavus Hinrichs, of Iowa City:

December, 1884, was windy, cloudy, and very cold, with frequent and much precipitation, northwesterly winds prevailing.

The mean temperature of the air was 5° below normal. December has not been as cold since 1880, and has but five times been colder during the past forty-six years. The first decade was decidedly mild, being 7° above normal. The second decade was extremely cold, averaging 14° below normal. The third decade was as severe during its first half, but quite warm during the four days of thaw and rain of the last half, so as to average only 8° below normal. On ten days of the month the temperature fell to or below zero Fahrenheit, namely, from the 16th to the 19th, from 22d to the 26th, and on the 31st. The first "cold spell" came on gradually, but the second and last were quite sudden.

Precipitation was very frequent, a measurable amount falling on nineteen days. Generally it was a light or moderate snow, except from the 27th to the 30th, when rains were general, continued, and quite abundant. Sleighing was good until this thaw set in.

The month and the year closed with a brilliant and greatly varying lunar halo. The nearly full moon rose on the last day with a fine luminous cross, thereafter showed fine mock-moons, also the common luminous circle, and at midnight the lower contact arch appeared like a brilliant inverted rainbow in the south below the moon and its ring.

The probability given at the close of the November bulletin is and professed to be simply a direct statement of fact, so far as we possess the same, namely, for the past forty-six years. If the present winter continues to be severe, we shall have had three consecutive winters much more severe than any three consecutive winters of which we have any record in Iowa. Thus far, a decidedly cold December has five times in seven been followed by a cold January.

The following is an extract from the December report, 1884, of the Nebraska Weather Service, under the direction of Prof. Goodwin D. Swezey:

During the seven years, since our weather service has been established, there has been no December so cold, so cloudy, or with so large a snowfall as the past month. The mean temperature has been lower and the number of days below zero greater, although the number of moderately cold days has not been in excess. The lowest temperature of the month has been exceeded but once during this time, viz., in 1880.

The snowfall has been larger than any December previous during these seven years, being about double the normal amount. The precipitation has not been much above the average but has been almost wholly in the form of snow. The number of days on which snow fell has been greater than ever before during this time and also the number of cloudy days.

Precipitation.—The average of rain and melted snow, chiefly the latter, for the different sections of the state for December, 1884, is as follows: ne. section 1.28 inches; se. section 0.60; nw. section 1.07; sw. section 0.47. Greatest number of rainy or snowy days, eighteen, at Omaha.

No thunder or hail-storms have been reported during the past month; such are unusual in December, having occurred only once during the past seven years, viz., in December of 1882. Fogs have occurred but not to a marked extent.

The following is an extract from the December, 1884, report of the "Minnesota Weather Service," under the direction of Prof. William W. Payne, of the Carleton College, Northfield:

A review of the weather at Carleton College observatory for December, 1884, shows us interesting features, a period of mild weather, lasting from the 1st to the 8th, inclusive, with low barometer, west and southwest winds, and a range of temperature from 15°.0 to 45°.2. The mean temperature was 18°.6 colder than November, this year, and 7°.7 colder than December, 1883. The maximum temperature was above 40°.0 on the 2d, 3d, and 4th, the maximum for the month (45°.2) occurring on the 3d. A heavy rain, freezing as it fell, began at 5 p. m. on the 6th, changing into heavy snow during night. Previous to this the three inches of snow on the ground at the beginning of the month had nearly disappeared. Comparatively mild weather prevailed from the 9th to the 15th, inclusive, with a range of the temperature from —2°.5 to 27°.5. Very light snow occurred at intervals on the 12th and 13th, followed by a fall of three inches on the 14th. A bright yellow sunset was noted on the 9th. On the 15th there was a decided fall in temperature, the first zero reading of the month being recorded, and a rapid increase in pressure, the barometer showing a high range and the temperature remaining constantly below zero until 7 a. m. on the 20th. The 18th and 19th were very cold days, showing a maximum of only —15°.5 and —3°.5 and a minimum —28°.0 and —29°.0, respectively, the mean temperature of the 18th being —22°.2.

The precipitation was greater than the average for a winter month, being 1.70 more than November, 1884, and 0.72 more than for December, 1883.

The following is an extract from the December, 1884, report of the "Tennessee Weather Service," under the direction of Hon. A. J. McWhirter:

The special meteorological features for December were the low temperature which prevailed throughout the state on the 19th and the high winds which prevailed about the 21st. Except these there was little outside the normal status of the weather for the month

The mean temperature for the month was 39°.14, 3°.73 below the December mean of last year and 5°.96 below the mean for November. The mean of maximum temperatures was 65°.4, 1°.6 below, and the mean of minimum temperatures was 5°, 14° below those for December of last year. The range of temperature was 7° greater than that in December of last year. The highest temperature was general in the eastern part of the state on the 29th, 30th; in the middle division on the 11th, 30th, and in the western division on the 4th, 30th. The lowest temperature was general throughout the state on the 19th, only two exceptions being reported, viz.: Andersonville, in the eastern division, and Covington, in the western, on the 18th. The lowest temperature was reported at Dyersburg, and was 1° below zero. The lowest temperatures were generally in the western division—rather a departure from the normal.

The mean depth of rainfall was 5.32 inches, 1.01 inch greater than the December mean of last year, and 3.76 inches greater than the November mean. There was a very fair distribution of precipitation throughout the state, the extremes being from 2.19 inches at Sunbright to 9.14 inches at Memphis. Only three stations report under three inches. A very small proportion of this precipitation was of melted snow. The days of the greatest rainfall were the 5th, 6th, 11th, 14th, 18th, 21st, and 31st. The greatest daily rainfall was on the 21st, averaging for the state 1.46 inches. The greatest local daily rainfall was 3.05 inches on the 29th at Memphis. The rains of the 5th, 6th, 11th, 14th, 18th, 21st, and 31st were general. The rain of the 12th was confined almost exclusively to the eastern division; that of the 20th to the middle and western divisions, and that of the 22d to the eastern and middle divisions. The rains of the 27th, 28th, 29th, and 30th were mostly confined to the western division. The 1st, 2d, 3d, and 8th were rainless days.

The snowfall during the month was light, averaging only 0.25 inch for the state. The greatest depth reported was 2 inches, at Greeneville and Sunbright.

There were several frosts—many of them were general, viz.: 2d, 3d, 7th, 9th, 10th, 16th, and 26th; that of the 16th was perhaps the heaviest of the month.

Thunder-storms were reported as follows: Greeneville, 22d; Knoxville, 22d, from 4 to 6 a. m., from se.; Maryville, 22d, 3 a. m., very loud thunder and vivid lightning; Farmingdale, 22d, from w. to e., 14th; 21st from n.; Riddleton, 6th, 2 p. m., clouds' direction sw., wind direction se., force 5; 2.15 p. m., wind se., force 7; thermometer at 7 a. m., 58°, 2 p. m., 51, 9 p. m., 50°; rainfall, .49 inch; Pulaski, 21st; Savannah, 21st; Milan, 28th, 3 a. m., in s. and sw., motion n., rain 1.25 inch; Trenton, 30th, 7.30 p.m.; Bolivar, 21st; Dyersburg, 30th, 7 p. m., from sw. to ne., with brilliant, bluish lightning and loud thunder; Somerville, 31st; Memphis, 28th.

Distant thunder was heard as follows: Riddleton, 11th, 10.30 p. m., nw.; Savannah, 11th; Milan, 30th, 6.55 p. m., w.; Trenton, 30th, 7.30 p. m., w., with lightning.

Distant lightning was observed as follows: Quarter, 5th, 22d, sw. and nw.

State summary.

Mean temperature, 39°.14; highest temperature, 72°, on the 30th, at Riddleton; lowest temperature, —1°, on the 19th, at Dyersburg; range of temperature, 73°; mean monthly range of temperature, 60°.4; greatest monthly range of temperature, 69°, at Dyersburg; least monthly range of temperature, 49°, at Sailor's Rest; mean daily range of temperature, 14°.8; greatest daily range of temperature, 37°, on the 3d and 27th, at Grief; least daily range of temperature, 1°, on the 5th, at Savannah, Trenton, Bolivar, Dyersburg, and Somerville; on the 12th, at Greeneville; on the 13th, at Waynesboro; on the 15th, at Parksville; on the 21st, at Riddleton; on the 28th, at Kingston Springs; on the 29th, at Florence Station and Howell, and on the 30th at Grassy Cove; mean of maximum temperatures, 65°.4; mean of minimum temperatures, 5°.

Mean depth of rainfall, 5.32 inches; mean daily rainfall, .171 inch; greatest rainfall, 9.14 inches, at Memphis; least rainfall, 2.19 inches, at Sunbright; greatest local daily rainfall, 3.05 inches, on the 29th, at Memphis; days of greatest rainfall, 6th, 11th, 14th, 21st, and 31st: day of greatest rainfall during month, 21st.

Average number of days on which rain fell, 10.3; average number of clear days, 5.8; average number of fair days, 6; average number of cloudy days, 18.2.

Prevailing direction of wind, north.

Average snowfall during month, 0.25 inch.

Prof. W. H. Ragan, of Greencastle, Indiana, furnishes the following meteorological summary for the state, with the accompanying remarks:

Districts.	Temperature.				Precipitation.	* Departure from normal
	Highest.	Lowest.	Monthly mean.	* Departure from normal		
	°	°	°	°	°	
Northern counties	62	—20	26.1	— 6	5.62	+3.00
Central counties	62	—31	27.2	— 5	6.34	+3.00
Southern counties	66	—12	32.4	— 4	5.73	+2.00
State	66	—31	28.6		5.90	

* NOTE.—The departures are approximated.

The first and last days of the month were moderately warm; the middle of the last half was very cold, when the lowest temperatures for the month occurred in nearly all parts of the state at almost the same hour, as nearly as can be ascertained from the observers reports. Ample warning of the approach of this cold wave was given by the Signal Service, which was of great value as distributed, but the benefits would have been far greater had the proper provision been made to profit by it in all parts of the state. The month of December, 1876, was the coldest on our records and 1877 the warmest. Four Decembers were colder than that of 1884 at Indianapolis; two at Romney, and nine at Vevay, in the periods covered by the records, viz: for thirteen, twelve, and twenty-two years, respectively. The variations in the mean temperature of the month are very great, showing an extremely variable winter climate.

In previous Decembers the precipitation was greater, one year at Romney and nine years at Vevay. At Indianapolis the precipitation for the year 1884, was greater than in three of the twelve years immediately preceding. At Romney it was greater than in nine out of twenty-one years.

This year for the first time every station of the Indiana Weather Service reported minus temperatures in December.

The snowfall was, it is believed heavier than usual in the northern and central counties.

The following is an extract from the December, 1884, bulletin of the "New England Meteorological Society":

The New England Meteorological Society is a voluntary association of persons interested in the study of atmospheric phenomena in New England. Meetings are held on the third Tuesdays of October, January, and April, at places designated for each meeting. All who desire to further the interests of the society are invited to apply to the secretary for membership. Each member pays an annual fee of $3. There is urgent need of increasing the membership, since the society depends upon the fees of members for meeting its current expenses. The bulletin is published monthly, and contains a summary of the meteorological conditions of the preceding month, with other items of interest. It is furnished without charge to members and co-operating observers. Observations are welcomed from any one, and circulars have been prepared, containing suggestions as to instruments and methods of observation, which aim to promote greater uniformity and accuracy among observers. The circulars and blank forms for recording the observations can be obtained by applying to the director.

Correspondence relating to the society and to membership should be addressed to W. M. Davis, secretary, Cambridge, Massachusetts

Correspondence relating to matters of observation should be addressed to Winslow Upton, director, Providence, Rhode Island.

SUMMARY FOR DECEMBER, 1884.

The following discussion of the meteorological conditions of the month is based upon reports from sixty-four observers, seven of whom are observers of the U. S. Signal Service. Use has been made of the daily weather maps of the Signal Service, and of various other publications.

General conditions.—The month has been disagreeable and stormy, and characterized by excessive precipitation, high average temperature, and rapid changes between the extremes of heat and cold.

Precipitation.—The partial drought of the autumn months was followed by abundant rain and snow. The average precipitation in different parts of New England, for December, varies from 2.5 to 5.5 inches; in the past month the smallest amount reported was 2.60 inches at Burlington, Vermont, and the greatest 9.59 inches at Princeton, Massachusetts. The comparisons show a large excess over the average of former years, except in the northern portions of New England, where the amount is not far from normal. This excess was due to the especially heavy rainfall in the three principal storms of the month. The snowfall has been abundant, but the high temperatures of the closing days of the month caused it to disappear completely in the southern portion, and left only traces in the northern portion of the district.

Temperature.—The temperature has been above the average, but there have been extremely low as well as high temperatures, and rapid changes between the two extremes. Three distinct periods of high temperature may be noted, which occurred in conjunction with the leading storms, while a fourth prevailed on the closing days of the month.

Two periods of low temperature were especially marked, one on the 19th and 20th, the other on the 26th and 27th. The former was very severe and widespread. In many places the mercury was below zero during the whole of the 19th, and a strong wind was blowing. The second cold period was confined to the northern portion of the district, but at a few stations the minimum of the month was observed during its occurrence.

In connection with the latter an anomalous condition of temperature was shown in New Hampshire. On the morning of the 27th, when the wind was everywhere light, the temperature at the summit of Mount Washington, +16°, while at stations at lower levels north of the Massachusetts boundary, the temperatures ranged from —10° to —24°. A more striking instance of the disturbance of the usual law of decrease of temperature with increase of altitude is rarely noted.

The rapidity of changes was a marked feature in the temperature. The storm of the 21st and 22d, with high temperatures, followed the severe cold of the 20th, and the difference of temperature in forty eight hours was in many instances above 60°. At Providence, R. I., the self-recording thermometer in the office of the city engineer showed a rise of 62° in forty-three hours, and at Norfolk, Connecticut, the range between the minimum on the 20th and the maximum on the 22d was 73°.

The month began with no frost in the ground in southern New England, and at its close the frost was again out of the ground in the southern portion and to a great extent in the northern portion.

Storms.—The storms of the month were all general throughout the district. Three barometric depressions of special note passed over the lake region and Saint Lawrence valley, though not over New England itself. These depressions were attended by very high temperatures and excessive rains. They passed near New England on the 7th, 15th, and 22d, respectively, and in each case the barometric pressure at the storm-centre was 29.3 inches. The rains were most abundant in the southern portion of the district, many stations reporting more than two inches in each storm. The winds were high, as is usual with depressions of this extent.

Winds.—The wind velocities reached their maximum values for the month in connection with the storms just mentioned. At New London, Connecticut, the maximum, forty miles per hour, occurred with the first storm; at Eastport, the maximum, forty-eight miles, with the second; and at Boston, the maximum, forty-four miles, with the third. High winds also occurred as the barometer rose after the depression had passed. The wind at the summit of Mount Washington was so severe in the early part of the month that all the anemometers were damaged and the wind record for the month rendered incomplete.

Miscellaneous.—No auroras were observed for a certainty, though on several dates their presence was suspected.

Earthquake shocks were reported at Centre Harbor, New Hampshire, and adjoining towns, on the 17th, and at Northampton, Massachusetts, on the 4th, at 12.18 a. m.

Lightning and thunder were noted at Middletown, Connecticut, on the 6th; at Provincetown, Massachusetts, on the 20th; and at Taunton, Massachusetts, on the 23d.

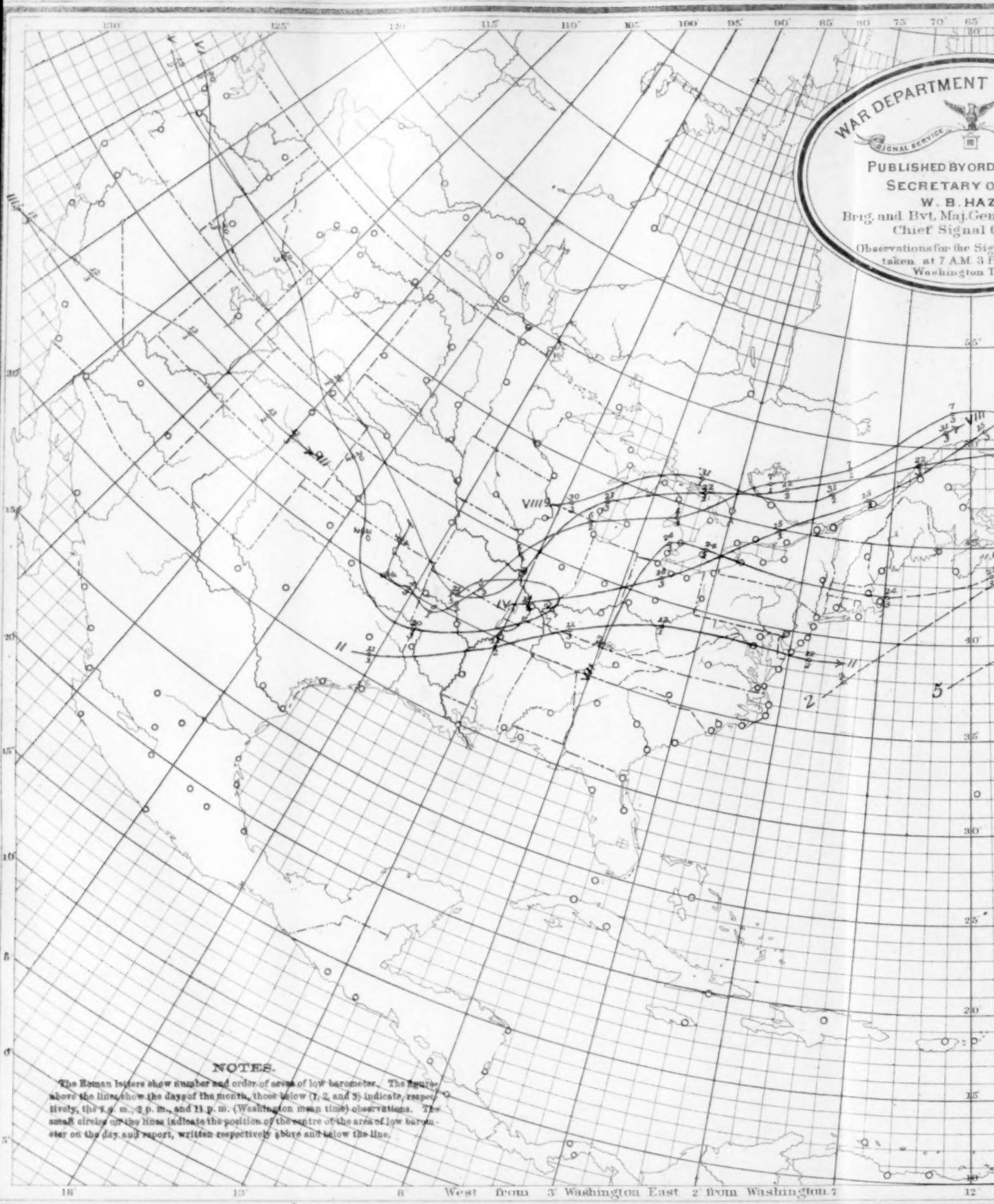
The coloring of the sunset sky was noteworthy, and was as pronounced at the close of the month as at the beginning. On the 30th, at Providence, Rhode Island, the pinkish glow appeared thirty minutes after sunset; five minutes later the color was orange, and fifty minutes after sunset an orange line at the horizon was still plainly visible. A haze was noted about the sun on all clear days.

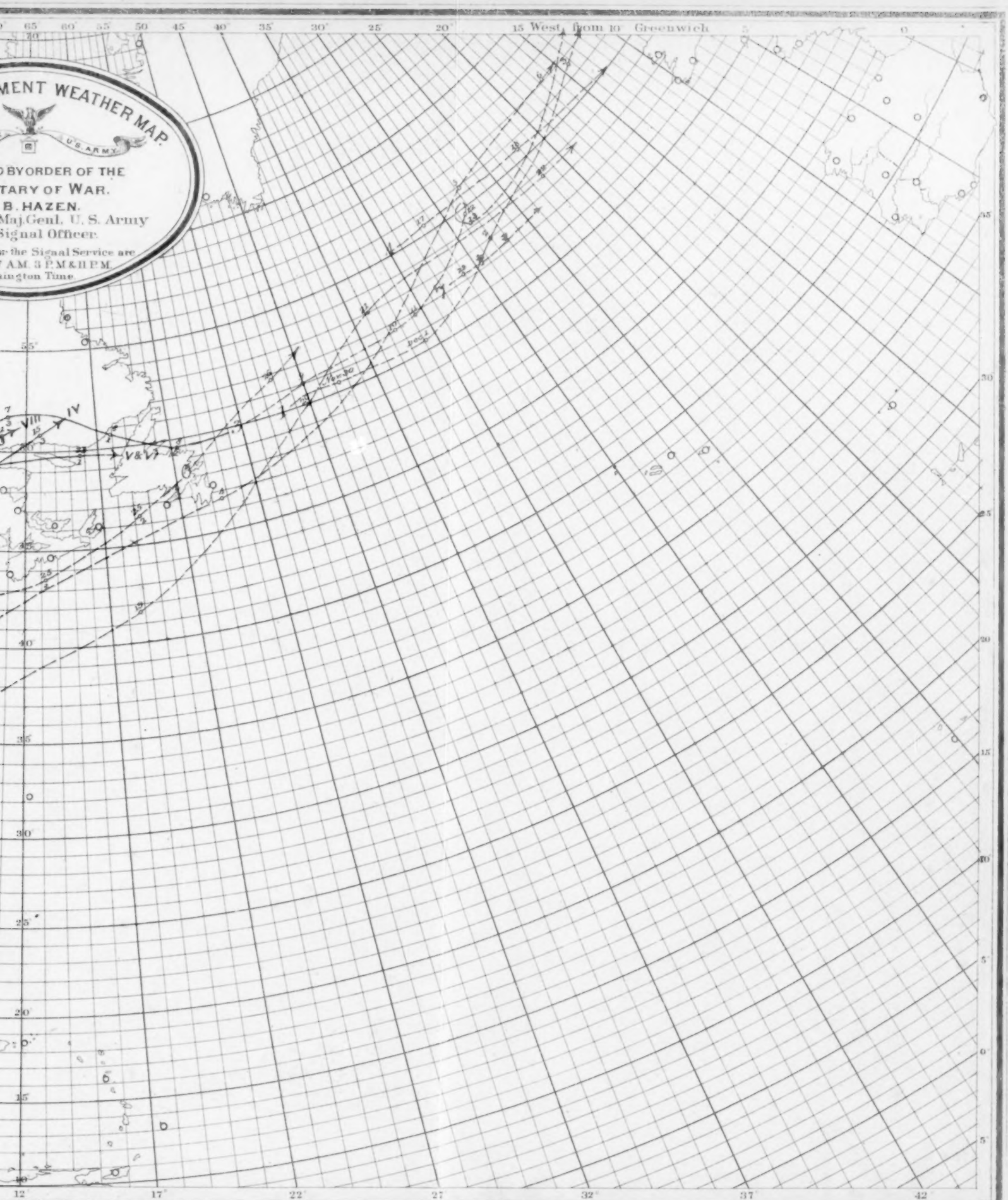
The following is an extract from the December report of the "Illinois Weather Service," under direction of Mr. S. D. Fisher:

Districts.	Temperature.			Precipitation.
	Highest.	Lowest.	Mean.	
	°	°	°	
Northern counties	61.2	—21.3	23.3	4.16
Central counties	66.0	—13.0	26.2	4.74
Southern counties	67.0	—10.0	31.2	7.39
State	67.0	—21.3	26.9	5.40

Chart I. Tracks of Low-Barom

orm 106 C 1884.

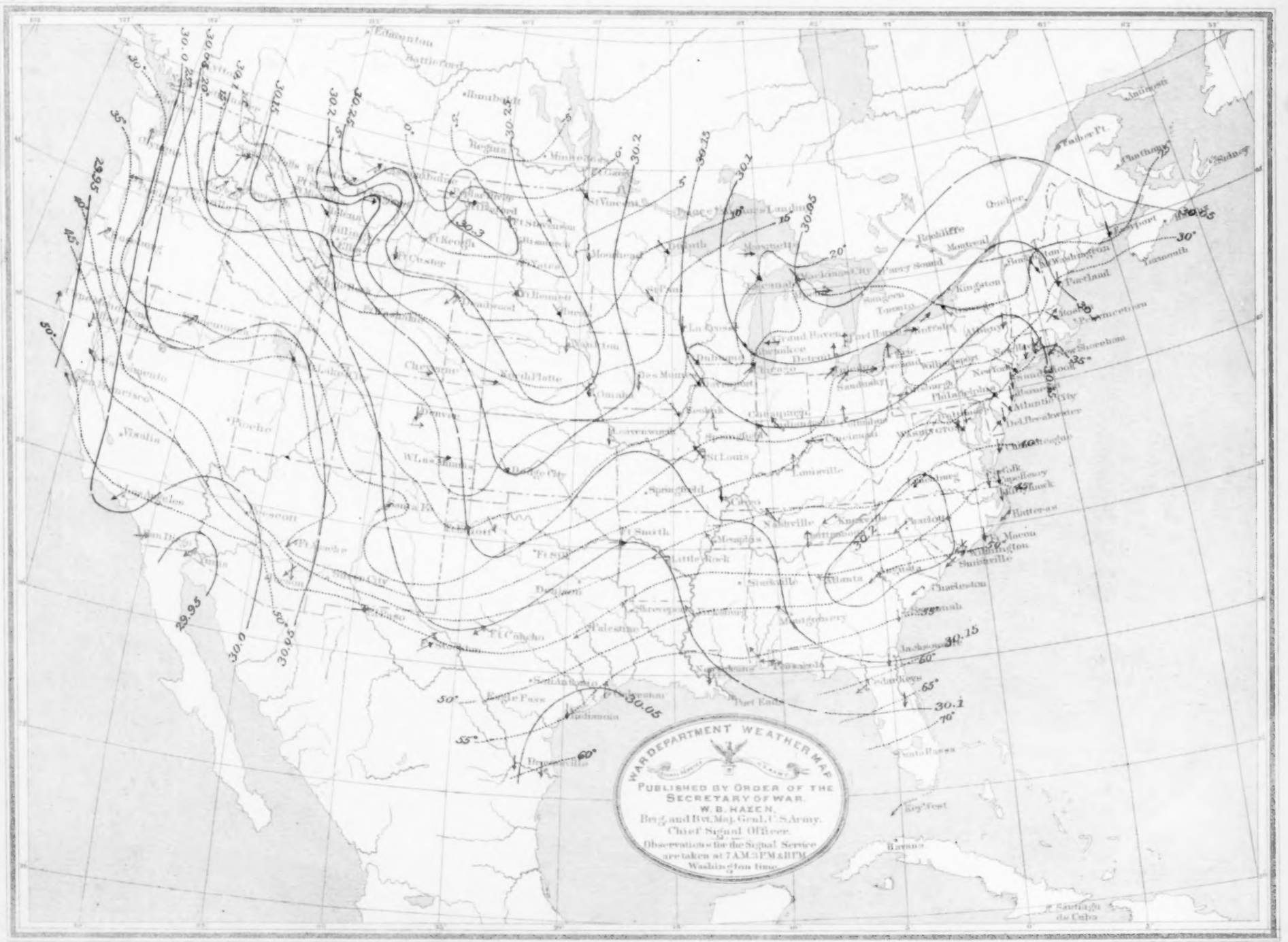

WAR DEPARTMENT
SIGNAL SERVICE
PUBLISHED BY ORD
SECRETARY O
W. B. HAZ
Brig. and Bvt. Maj. Gen
Chief Signal
Observations for the Sig
taken at 7 A.M. 3 P
Washington T
NOTES.
The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month, those below (1, 2, and 3) indicate, respectively, the 7 a. m., 2 p. m., and 11 p. m. (Washington mean time) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
West from 3° Washington East 2° from Washington.


MENT WEATHER MAP.
U.S. ARMY
BYORDER OF THE
TARY OF WAR.
B. HAZEN.
Maj.Genl. U. S. Army
Signal Officer.
the Signal Service are
A.M. 3 P.M & 11 P.M.
ington Time.
15 West from 10 Greenwich
VIII
IV
V & VI
65 60 55 50 45 40 35 30 25 20 15 10 5 0
70 55 40 35 25 20 15 10 5
12 17 22 27 32 37 42

Signal Office Lith

Form 106 F.

Chart II. Isobars, Isotherms, and Winds. December; 1884.


WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U.S. Army.
Chief Signal Officer.
Observations by the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. Washington time.

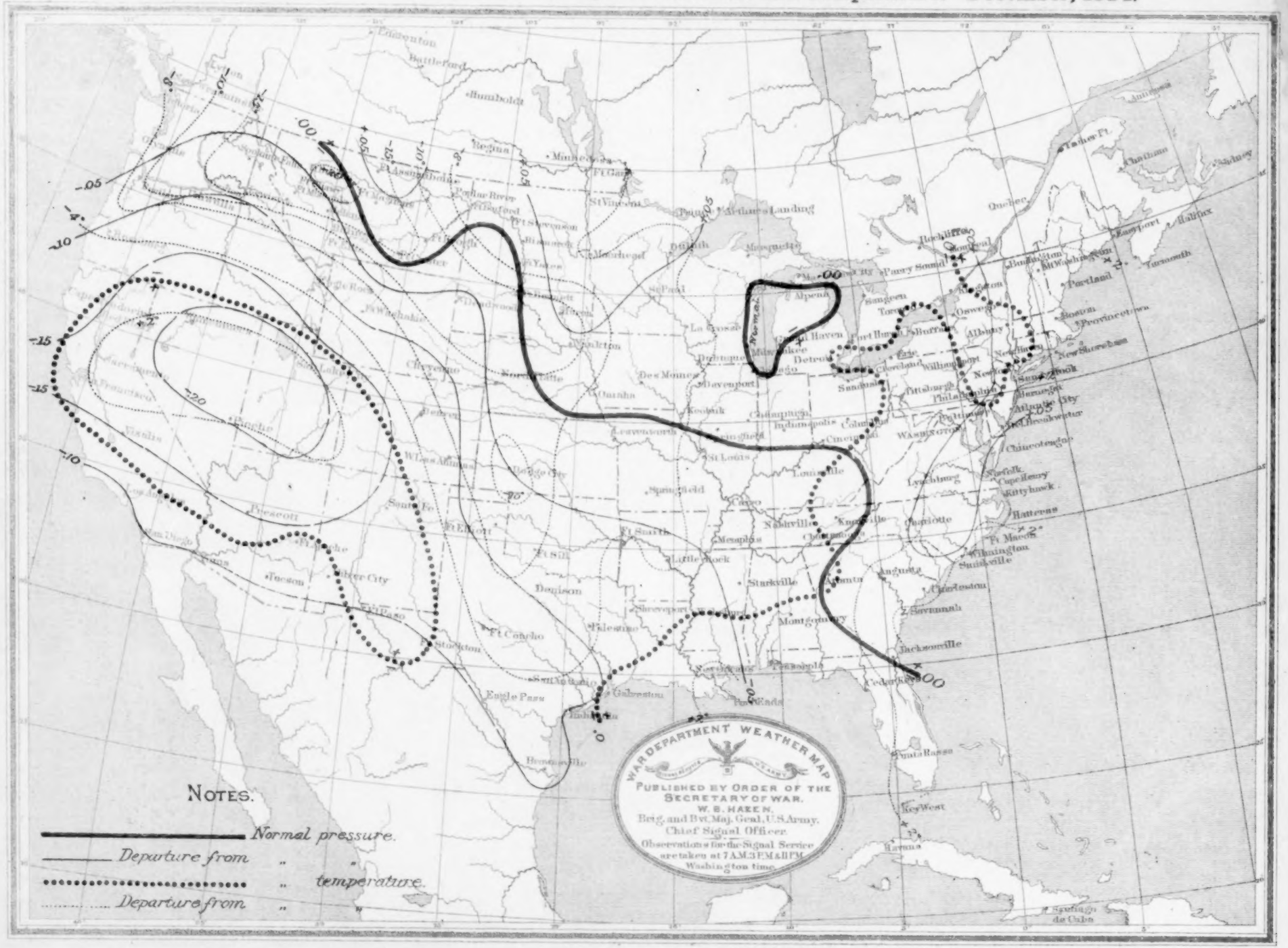
Signal Office Lith.

Form 106 F

Chart III. Precipitation, December 1884.

Scale of Shades.
From 0 to 2 in
" 2 " 4 "
" 4 " 6 "
" 6 " 8
Over 8
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U.S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 2 P.M. & 11 P.M.
Washington time.

Chart IV. Departures from Normal Atmospheric Pressure and Temperature. December, 1884.


WAR DEPARTMENT WEATHER MAP
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W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U.S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. Washington time.
NOTES.
Normal pressure.
Departure from " "
" temperature.
Departure from " "

Signal Office 14th.

Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for December, 1884.

Observer and place of observation.

Anderson, Dr. W. W., Stateburg, S. C.
Altaffer, J. M., Independence, Kans.
Adams, Dr. O. H., Vineland, N. J.
Andrews, L., Southington, Conn.
Abbott, Dr. E. K., Salinas City, Cal.
Bennett, Geo, Bandon, Oreg.
Beloit College, Beloit, Wis.
Bell, Joseph, Franklin, Pa.
Bowen, F. W., Humboldt, Iowa.
Brainerd, Dr. H. G., Independence, Iowa.
Baker, Dr. Henry B., Lansing, Mich.
Beall, Dr. R. L., Lenoir, N. C.
Brendel, Fred., Peoria, Ill.
Bentley, David, Princeton, Cal.
Bowman, Peter, Ruggles, Ohio.
Boerner, Prof. Chas. G., Vevay, Ind.
Bartlett, E. B., Vermillion, N. Y.
Baldwin, A. L., Bethel, Conn.
Bardsley, Jas. G., Nephi, Utah.
Briggs, John, Albany, Oreg.
Boggs, W. R., Brevard, N. C.
Beans, Thos. J., Moorestown, N. J.
Betts, Prof. Arthur, Webster, Dak.
Breed, J. E., Embarras, Wis.
Buck, Mrs. R., Red Willow, Nebr.
Baker, Dr. L. J., Ottumwa, Iowa.
Boynton, J. F., Syracuse, N. Y.
Boies, Lieut. A. H., Hudson, Mich.
Becker, Rev. W., Prairie du Chien, Wis.
Ballou, Dr. N. E., Sandwich, Ill.
Boyd, Joseph, Oskaloosa, Iowa.
Blake, J. H., Christmas Prairie, Cal.
Beebe, A., Manistique, Mich.
Beecher, Chas., Newport, Fla.
Bryant, A. F., Yutan, Nebr.
Charbonnier, Prof. L. H., Athens, Ga.
Cook, S. A., Milledgeville, Ga.
Cotton, Dr. D. B., Portsmouth, Ohio.
Clark, A. C., Wausau, Wis.
Casey, Geo., Auburn, N. Y.
Crawford, E. A., Liberty Hill, La.
Curtiss, G. G., Fallston, Md.
Cornell University, Ithaca, N. Y.
Cutler, B. B., Heath, Mass.
Cocke, A. R., Indianola, Iowa.
Cutting, Hiram A., Lunenburg, Vt.
Crosier, Adam, Laconia, Ind.
Caulkins, John S., Thornville, Mich.
Clark, T. A., Weldon, N. C.
Crawford, D. F. G., Leetsdale, Pa.
Coffin, Prof. S. J., Easton, Pa.
Carleton College, Northfield, Minn.
Chandler, Dr. W. J., South Orange, N. J.
Cass, John J., Allison, Kans.
Chase, Pliny E., Haverford College, Pa.
Carter, Rev. Dr. W. H., Tallahassee, Fla.
Comstock, Prof. F. M., Le Roy, N. Y.
Cochran, Wm. P., Clay Centre, Kans.
Calhoun, P. B., Austin, Tenn.
Carpenter, Dr. W. B., Leavenworth, K.
Christ, Jacob, Franklin, Wis.
Cheney, Wm., Minneapolis, Minn.
Cox, Prof. T. E., Emmitsburg, Md.
Caffee, Wm. K., Carthage, Mo.
Collin, Prof. Alonzo, Mt. Vernon, Iowa.
Cooper, Dr. Geo. C., Manatee, Fla.
Couch, E. D., Contoocook, N. H.
Chapin, Miss M. A., Highlands, N. C.
Chapin, Adams, Poway, Cal.
Cleveland, Dr. G. H., Moorestown, Mich.
Cowgill, Mrs. S. P., Sterling, Kans.
Cutler, J. L., Quitman, Ga.
Culver, G. E., Vermilion, Dak.

Observer and place of observation.

Davis, Jacob, Rowe, Mass.
Dickinson, Jas. R., Guttenberg, Iowa.
Dechant, Wm., Tamaqua, Pa.
Deming, H. D., Wellsboro, Pa.
Dozier, Wm., Mattoon, Ill.
Dewhurst, Rev. E., Voluntown, Conn.
Day, Theodore, Dyberry, Pa.
Dawson, Wm., Spiceland, Ind.
Dunton, Lieut. W. R., Dorset, Vt.
Dunlap, W. L., Tecumseh, Nebr.
Dow, Roswell, Sycamore, Ill.
Dudley, C. B. Altoona, Pa.
Doton, Hosea, Woodstock, Vt.
Douglas, Dr. B. H., Asheville, N. C.
Davis, Prof. C. F., Fort Collins, Colo.
Eliason, W. A., Statesville, N. C.
Eckstein, Rev. M., Conception, Mo.
Ellis, John, Marquette, Nebr.
Ellsworth, W. W., Hartford, Conn.
Elliott, J. C., Swanwick, Ill.
Fernald, Prof. M. C., Orono, Me.
Friend, Chas. W., Carson City, Nev.
Fleming, John, Readington, N. J.
Ferris, B. F., Sumnan, Ind.
Fouch, Dr. A., College City, Cal.
Foss, E. T., Hydesville, Cal.
Fox, F. E., Fall Brook, Cal.
Ferguson, W., Paterson, N. J.
Gates, W. B., Burlington, Vt.
Gillingham, W., Accotink, Va.
Grathwohl, John, Blooming Grove, Pa.
Gillingham, Milnor, Failsington, Pa.
Gardiner, R. H., Gardiner, Me.
Gowey, H. D., North Lewisburg, Ohio.
Gibson, John H., Salina, Kans.
Green, Dr. Jesse C., West Chester, Pa.
Gerrish, S. H., Sacramento, Cal.
Gray, J. W., Stockham, Nebr.
Gray, F. R., Yates Centre, Kans.
Goodwin, Wm., North Colebrook, Conn.
Geddings, Dr. W. H. Aiken, S. C.
Gregory, J. W., Sherlock, Kans.
Gibbs, Geo. J., Grand Turk, British West Indies.
Heath, E. R., Wyandotte, Kans.
Horn, Dr. H. B., Atchison, Kans.
Hiram College, Hiram, Ohio.
Harvard College Observatory, Cambridge, Mass.
Hammitt, John W., College Hill, Ohio.
Heaton, Isaac E., Fremont, Nebr.
Helm, Thos. B., Logansport, Ind
Hoskinson, R. M., Bainbridge Island, Wash Ter.
Hunter, Dr. T. C., Walbash, Ind.
Haywood, John, Westerville, Ohio.
Hyde, G. A., Cleveland, Ohio.
Hassler, B. K., Chambersburg, Pa.
Hartzler, J. A., Mottville, Mich.
Hall, J. B., Worcester, Mass.
Hazen, L. G., Terre Haute, Ind.
Hurlin, Rev. Wm., Antrim, N. H.
Howe, Prof. J. L., Richmond, Ky.
Hoyt, F. C., Easton, Pa.
Houghton Farm Experiment Station, Mountainville, N. Y.
Heatwole, L. J., Dale Enterprise, Va.
Hurley, J. M., Lancaster, Wis.
Harris, Thos. C., Raleigh, N. C.
Heacock, J. L., Quakertown, Pa.
Hazen, Rev. A., Deerfield, Mass.
James, John W., Marengo, Ill.
Jones, Dr. E. U., Taunton, Mass.

Observer and place of observation.

Jordan, Dr. M. D. L., Milan, Tenn.
Jones, Ira B., Neillsville, Wis.
Knapp, J. G., Limona, Fla.
Keese, G. Pomeroy, Cooperstown, N. Y.
Kuhne, F. W., Fort Wayne, Ind.
Keeler, W. F., Mayport, Fla.
Kirkwood, E., Mauzy, Ind.
Kent, Miss E., Phillipsburg, N. J.
Lueps, Miss Johanna, Manitowoc, Wis.
Lincoln, A. T., Marion, Va.
Loomis, J. C., Jeffersonville, Ind.
Lay, Dr. J. C., Pueblo, Colo.
Lucas, Dr. G. L., Albion, Idaho.
Luther, S. M., Garrettsville, Ohio.
Ladshaw, Geo. E., Pacolett, S. C.
Lovewell, Prof. J. T., Topeka, Kans.
Mill r, H. D., Drifton, Pa.
McDonogh Institute, McDonogh, Md.
McCready, Miss L. A., Fort Madison, Iowa.
Moore, C. R., Johnsontown, Va.
Munn, A. M., Kalamazoo, Mich.
Metcalf, Dr. John G., Mendon, Mass.
Micklem, J. Howard, Variety Mills, Va.
Meehan, Thos., Germantown, Pa.
Moore, Nathan, Grampian Hills, Pa.
Mikesell, Thos., Wauseon, Ohio.
McPherson, Wm., San Rafael, Cal.
McClintock, F., West Union, Iowa.
Marshall, G., Cresco, Iowa.
Neal, Dr. J. C., Archer, Fla.
Newbegin, John D., Anna, Ill.
Nelson, P. P., Northport, Mich.
Neill, Thos., Sandusky, Ohio.
Newcomb, G. S., Westborough, Mass.
Nourse, H. D., Washington, D. C.
Noll, A. B., Somerville, N. J.
Nordberg, A., Richardton, Dak.
Nicholson, Dr. A. W., Boyne, Mich.
Nickerson, W. W., Klamath Agency, Oreg.
Osborn, Dr. Thos C., Cleburne, Tex.
Osmond, Prof. I. T., State College, Pa.
Olds, H. D., Cedar Rapids, Iowa.
Owsley, Dr. J. B., Jacksonborough, O.
Pearce, Thomas, Eola, Oreg.
Parmelee, Francis D., Hillsdale, Mich.
Pierson, Rev. J., Ionia, Mich.
Powrie, W., Sussex, Wis.
Parrish, Geo. W., Ellensburg, Wash. T.
Patterson, Wm., Salem, N. J.
Partrick, J. M., North Volney, N. Y.
Purdue University, La Fayette, Ind.
Prosser, Chas. S., Ithaca, N. Y.
Remington, C. V. S., Fall River, Mass.
Robertson, T. D., Rockford, Ill.
Rogers, F. M., Luling, La.
Renfrew, H. N., Wilton Center, Ill.
Rodman, Thos. R., New Bedford, Mass.
Rockwood, Prof. C. G., Princeton, N. J.
Shaw, J., Chester, Minn.
Shriver, E. T., Cumberland, Md.
Seltz, Chas., De Soto, Nebr.
Scott, Thos. G., Forsyth, Ga.
Stucky, Dr. C. T., Helvetia, W. Va.
Stern, Jacob T., Logan, Iowa.
Slade, Elisha, Somerset, Mass.
Slenker, Mrs. E. D., Snowville, Va.
Scribner, H. F. J., Strafford, Vt.
Shriver, Howard, Wytheville, Va.
Smith, H. D., Monticello, Iowa.
Shahan, Chas. C., Edgington, Ill.
Safford, A. T., Williamstown, Mass.

Observer and place of observation.

Sherman, W. B., Manchester, Iowa.
Smith, Rev. D. W., Troy, Pa.
Samostz, Oscar, Austin, Tex.
Spooner, Lieut. G. H., Blacksburg, Va.
Staudenmayer, Dr. L. R., Lincolnton, N. C
Snell, Miss S. C., Amherst, Mass.
Sanderson, H. S., Clarksville, Tex.
Shaw, E., Maud, Kans.
Sim, John R., Summit, Va.
Sewell, T. M., New Athens, Ohio.
Sommerville, W. B., Birmingham, Ala.
Snow, Prof. F. H., Lawrence, Kans.
Shepard, E. M., Springfield, Mo.
Starr, Prof. F., Cedar Rapids, Iowa.
Sadler, Prof. H. E., Emporia, Kans.
Spilman, J. J., Pierce City, Mo.
Stone, W. E., Amherst, Mass.
Trembley, Dr. J. B., Oakland, Cal.
Todd, Prof. David P., Amherst, Mass.
Teele, Rev. A. K., Milton, Mass.
Truman, Geo. S., Genoa, Nebr.
Turnbo, Silas C., Pro Tem, Mo.
Tillinghast, C. B., Albany, N. Y.
Turner, Ernest, Point Pleasant, La.
Tyrrel, A. C., Madison, Nebr.
Treimer, Geo., Round Grove, Iowa.
Upton, Prof. W., Providence, R. I.
Van Inwegen, C. F., Port Jervis, N. Y.
Voegeli, Adolphus, Des Moines, Iowa.
Venable, Prof. F. P., Chapel Hill, N. C.
Washburne Observatory, Madison, Wis.
Wild, Rev. E. P., Newport, Vt.
Williams, Rev. C. F., Ashwood, Tenn.
Wing, Miss M. E., Charlotte, Vt.
West, Silas, Cornish, Me.
Went, E. C., Frankfort, Ky.
Wylie, Wm., Mount Forest, Canada.
Whittington, G., Mount Ida, Ark.
Walton, J. P., Muscatine, Iowa.
Wait, S. E., Traverse City, Mich.
Woodstock College, Woodstock, Md.
Wolfe, John H., Wellington, Kans.
West, Dr. Jos. O., Princeton, Mass.
Washington Aqueduct. — Receiving Reservoir, D.C; Distributing "; Great Falls Reservoir, Md; Rock Creek Bridge, D. C.
Winipiseogee Lake Cotton and Woolen Manufacturing Co. — Weir's Bridge, N. H.; Woodstock, N. H.; Wolfborough, N. H.; Lake Village, N. H.; Bristol, N. H.; Belmont, N. H.; Ashland, N. H.
Willis, O. R., A. M., Ph. D., White Plains, N. Y.
Williams, Dr. A. C., Elk Falls, Kans.
Whitney, Chas. E., Humphrey, N. Y.
Wigg, Dr. Geo., East Portland, Oreg.
Watters, Dr. Jas., Holton, Kans.
Woods, Mrs. Dr. A. G., Maynard, Iowa.
Wetmore, E. L., Tucson, Ariz.
Wright, J. W. A., Greensboro, Ala.
Watson, Dr. S. T., Nayatt Point, R. I.
Wadsworth, Dr. J. L. R., Collinsville, Ill.
Watson, Evan, Fort Scott, Kans.
Widman, Rev. C. M., Grand Coteau, La.
Wistrom, M. F., Harvard, Nebr.
Worth, J. M., Kelley's, N. C.
Yetter, Wm. G., Catawissa, Pa.
Yates, T. P., Factoryville, N. Y.
Young, Geo. R., Penn Yan, N. Y.
Zimmerman, F. C., Bunker Hill, Ill.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for December, 1884.

Alcatraz Island, Cal.
Angel Island, Cal.
Assinaboine, Fort, Mont.
A. Lincoln, Fort, Dak.
Benicia Barracks, Cal.
Bidwell, Fort, Cal.
Buford, Fort, Dak.
Brady, Fort, Mich.
Bridger, Fort, Wyo.
Brown, Fort, Tex.
Barrancas, Fort, Fla.
Concho, Fort, Tex.
Columbus, Fort, N. Y.
David's Island, N. Y. H.
Ellis, Fort, Mont.
Fred Steele, Fort, Wyo.
Gaston, Fort, Cal.
Hamilton, Fort, N. Y.
Klamath, Fort, Oreg.
Keogh, Fort, Mont.
Lyon, Fort, Colo.
Lewis, Fort, Colo.
Mason, Fort, Cal.
Madison Barracks, N. Y.
McDermitt, Fort, Nev.
Monroe, Fort, Va.
McHenry, Fort, Md.
Meade, Fort, Dak.
Mount Vernon B'ks, Ala.
Niagara, Fort, N. Y.
Presidio of San Francisco, Cal.
Plattsburg Barracks, N. Y.
Randall, Fort, Dak.
Robinson, Fort, Nebr.
Snelling, Fort, Minn.
Saint Augustine, Fla.
Sully, Fort, Dak.
Sisseton, Fort, Dak.
Shaw, Fort, Mont.
Townsend, Fort, Wash. T.
Totten, Fort, Dak.
Union, Fort, N. Mex.
West Point, N. Y.
Wingate, Fort, N. Mex.
Yates, Fort, Dak.

State weather services from which meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for December, 1884.

Alabama State Weather Service, under direction of Prof. P. H. Mell, Jr., Auburn, Alabama.
Louisiana Weather Service, under direction of Mr. Robert S. Day.
Missouri State Weather Service, under direction of Prof. Francis E. Nipher, Saint Louis, Mo.
Nebraska State Weather Service, under direction of Prof. Goodwin D. Swezey, Crete, Nebraska.
Indiana Volunteer Weather Service, under direction of Prof. W. H. Ragan, Greencastle, Indiana.
Indiana State Weather Service, under direction of Prof. H. A. Huston, La Fayette, Indiana.
Iowa State Weather Service, under direction of Prof. Gustavus Hinrichs, Iowa City, Iowa.
Tennessee State Weather Service, under direction of Hon. A. J. McWhirter, Nashville, Tennessee.
Minnesota State Weather Service, under direction of Prof. W. W. Payne, Northfield, Minnesota.
Illinois State Weather Service, under direction of Mr. S. D. Fisher, Springfield, Ill.
New England Meteorological Society: Prof. Winslow Upton, of Providence, director; Mr. W. M. Davis, of Cambridge, secretary.
Data have also been used from meteorological records of the Central Pacific and Southern Pacific railway companies.

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